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ERRATA

page 8 line 28 for '237' read '238'
29 1 for 'Kemp H. H.' read 'Kemp, H. K.'
45 14 for '*Jap. J. Bot.*' read '*J. Jap. Bot.*'
69 9 for '*citrocarpa*' read '*citricarpa*'
117 22 for '722' read '723'
170 lines 43 and 44 for '*Botryoplodia*' read '*Botryodiplodia*'
176 line 13 for 'Colombia' read 'Columbia'
201 23 for '[Jensen (J. H.).]' read '[Kevorkian (A. G.).]'
215 15 for 'De Almeida (E.)' read 'De Almeida (F.)'
233 38 for '*avensis*' read '*arvensis*'
234 lines 20, 33, and 42 for 'the Argentine' read 'São Paulo'
43 for 'indigenous' read 'Argentine'
242 line 30 for 'Boyd (C. C.)' read 'Boyd (O. C.)'
248 46 for '*Oligostoma*' read '*Oligostroma*'
262 43 for '*andropogoni*' read '*andropogonis*'
288 26 for 'D. R. J. de Villiers' read 'D. J. R. de Villiers'
296 17 for 'proprionic' read 'propionic'
304 5 for 'in Ottawa' read '[in Winnipeg]'
336 42 for '*Terminalis*' read '*Terminalia*'
424 45 for '*saubinetti*' read '*saubinetii*'
556 15 for '*sexte*' read '*sexta*'
557 26 for 'Cifferi' read 'Ciferri'
560 7 for 'I. H. Baldwin' read 'I. L. Baldwin'
571 20 for '*annum*' read '*annuum*'
602 34 for '*Sclerotia*' read '*Sclerotinia*'
615 25 delete [*Leptosphaeria salvinii*]
616 16 for '*cyclopeum*' read '*cyclopium*'
672 lines 11 and 12 for 'dwarf' read 'top'
697 line 31 insert '(*Ustilago hordei*)' after 'smut'

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IMPERIAL MYCOLOGICAL INSTITUTE

REVIEW
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VOL. XIX JANUARY 1940

DOUGLASS (J. R.), WAKELAND (C.), & GILLETT (J. A.). **Field experiments for control of the Beet leafhopper in Idaho, 1936-37.**—*J. econ. Ent.*, xxxii, 1, pp. 69–78, 5 figs., 4 graphs, 1939.

This account of experiments in the control of the beet leafhopper (*Eutettix tenellus*) in Idaho during 1936–7 contains various references to the activities of the insect as a vector of curly top [*R.A.M.*, xviii, p. 225]. Unpublished data by N. J. Giddings have shown that, in general, the smaller the beet, the more susceptible it is to curly top, but the new resistant varieties have given evidence of appreciable resistance even in the seedling stage. Very little difference in leafhopper infestation on the non-resistant R[abbethge] and G[iesecke] (Old Type) and resistant (U.S. 12) beet strains was observed in the field in 1937 until 23rd June, when the former began to break down under the disease. U.S. 12 produced a relatively satisfactory yield in the test plots even under heavy leafhopper infestation (12·60 tons per acre compared with 0·64 for the Old Type).

YOUNG (H. C.). **Dusting and spraying Sugar Beets.**—*Proc. Amer. Soc. Sug. Beet Technol., 1939*, pp. 13–20, 1939. [Abs. in *Facts ab. Sug.*, xxxiv, 9, p. 55, 1939.]

Leaf spot of sugar beet [*Cercospora beticola*: *R.A.M.*, xviii, pp. 721, 831] is commonly supposed to be serious only in one year out of five, but observations in Ohio over a ten-year period have shown that losses from this source may be expected almost annually. In 1937 they were particularly severe, entailing an average reduction of 2 to 5 tons per acre. Commercial control was obtained by three applications of a 6–8–50 Bordeaux mixture or fixed coppers (basic chlorides), the monohydrated copper sulphate and hydrated lime (20–80) dusts being less effective.

MAXSON (A. C.). **Beet root rot caused by Rhizoctonia solani.**—*Proc. Amer. Soc. Sug. Beet Technol., 1939*, pp. 38–45, 1939. [Abs. in *Facts ab. Sug.*, xxxiv, 9, p. 55, 1939.]

Sugar beet root rot surveys in Great Western Sugar Company territory in 1937 and 1938 indicated that 70·93 per cent. of the 970 cases of the disease reported were due to *Rhizoctonia*, probably *R.* [*Corticium*] *solani* [*R.A.M.*, xviii, p. 776]. The continuous cultivation of beets increased the incidence of infection, a similar effect being exerted by

potatoes preceding beets in the crop sequence, whereas maize and small grains greatly minimized the losses; no rot was present in 1935 in beet fields preceded by four years of grain.

WALKER (J. C.). **Disease resistant Pea varieties.**—*Canner*, lxxxviii, 12, p. 89, 1939. [Abs. in *Plant Breed. Abstr.*, ix, 4, p. 479, 1939.]

A fair number of pea varieties combining suitability for canning with resistance to common wilt [*Fusarium orthoceras* var. *pisi*: *R.A.M.* xviii, p. 777] are stated to be available, but new resistant types are required for the freezing industry. A high degree of resistance to 'near wilt' [*F. oxysporum* f. 8: loc. cit.] has hitherto been observed only in two canning varieties, Rogers K and Horal, themselves of little interest but of potential importance as parents in crossing. Breeding for resistance to root rot presents a highly complex problem owing to the implication in the etiology of the disease of several organisms [including (?) *F. solani* var. *martii* and *Aphanomyces euteiches*: loc. cit.].

HYDE (E. O. C.). **Observations on the germination and seedling establishment of Peas.**—*N.Z. J. Sci. Tech.*, A, xxi, 1, pp. 61–70, 4 figs., 1939.

Clean, moist sand has been found to be the most satisfactory medium for laboratory germination tests on peas, which in unsterilized soil are very subject to pre-emergence damping-off, mostly caused by soil-borne pathogens, such as *Fusarium* and *Pythium* spp. [*R.A.M.*, xvii, p. 286]. The disease is much more prevalent in 'wet' than in 'dry' soils (30 and 20 per cent., respectively, of the dry weight, the maximum water-holding capacity of the soil being estimated at 40 per cent.), the rate of seedling establishment ranging from 0 (Greenfeast 3) to 78 (Pioneer) per cent. in the former and from 55 to 96 for the same two varieties in the latter. Ceresan and agrosan have given satisfactory results in the reduction of damping-off, the optimum dust loads being 3 and 4 oz. per bush., respectively. The dusts are injurious to the seed only when applied in great excess under dry soil conditions. They neither produced adverse effects nor lost their efficacy during storage, the emergence rates of seed of Pioneer, William Massey, and Greenfeast dusted 15 months earlier being 73, 89, and 85 per cent. compared with 48, 39, and 26, respectively, for the untreated controls.

Agricultural research in Idaho. No. 1 of a series. Beans that resist mosaic and curly top.—*News Lett., Idaho*, xxii, 3, p. 1, 1939. [Abs. in *Plant Breed. Abstr.*, ix, 4, p. 478, 1939.]

Successful results are stated to have been secured in Idaho in the breeding of beans [*Phaseolus vulgaris*] showing combined resistance to mosaic and curly top [*R.A.M.*, xviii, pp. 296, 430]. Resistant strains of Red Mexican beans have been introduced under the names Red Mexican U.I. Nos. 3 and 34 and similar strains of the Great Northern, Red Kidney, Pinto, and other field varieties have been selected from hybrid populations and are undergoing further testing prior to release.

JENKINS (W. A.). **A new disease of Snap Beans.**—*Science*, N.S., xc, 2325, p. 63, 1939.

In June, 1938, the author observed in Georgia a new and very

destructive disease of snap beans [*Phaseolus vulgaris*], which reappeared in an even worse form in 1939. The chief symptom consisted in a deep brown to black discoloration of the inner phloem and outer xylem of the whole plant. The condition led to severe chlorosis, followed by wilting and death. Severely infected roots were dark grey to black on the outside. Brown to brownish-purple, longitudinal stripes of various widths were present on the upper hypocotyl and stem. Affected pods showed a purplish-brown discoloration of one or both sutures. Cross sections of diseased pods revealed that a few to all of the vascular bundles were discoloured, while the chlorenchymatous pulp of heavily infected young pods was frequently of an inky appearance. The greatest loss was incurred about blossoming time, only a few lightly infected plants surviving. No causal organism could be isolated, and the condition would appear to be due to a virus with a long incubation period, since plants raised from seed from infected pods remain healthy until blossoming time.

WEBER (G. F.). **Web-blight, a disease of Beans caused by Corticium microsclerotia.**—*Phytopathology*, xxix, 7, pp. 559–574, 7 figs., 1939.

A detailed account is given of investigations carried out in Florida into a disease, termed web blight, of Lima beans (*Phaseolus lunatus*), previously recorded as due to *Rhizoctonia microsclerotia* [*R.A.M.*, xiv, p. 416]. From 1935 to 1937, inclusive, infection caused an estimated loss of 66 per cent. at La Crosse, while in 1935 at Florahome it was responsible for a total loss in a 15-acre field of snap beans [*P. vulgaris*], and in 1936 produced over 50 per cent. loss in a 60-acre field of this crop in the same locality. The fungus has been observed to be parasitic on a large number of perennials and annuals.

The pathogen produces two types of mycelium, superficial and subepidermal. The former is about twice the diameter of the latter and spreads out fanwise over the leaf blade. The relatively small, superficial sclerotia, 80 to 300 by 80 to 600 (average 200 by 350) μ, are characteristic of the fungus and constitute the means by which it is usually disseminated. Wedge- to oval-shaped basidia are produced on hyphae attached to the surface of the host, each with four sterigmata bearing hyaline, non-septate, oval, slightly irregular basidiospores, 5 to 6 by 9 to 11μ. As the fungus is distinct from related species and has not before been recognized by a basidiospore stage, the binomial *Corticium microsclerotia* (Matz) n. comb. [n.sp.] (syn. *R. microsclerotia*) is proposed for it, the original description being amended.

The fungus grows readily in complete darkness, or continuous, intermittent, or subdued light, and covers the surface of a Petri dish in 24 to 36 hours at 80° to 85° F. on most media. The sclerotia, scattered directly from the host on the surface of potato agar plates, gave 100 per cent. germination in 12 hours. Artificial inoculations by sprinkling sclerotia over the leaf blades of wet plants kept in a moist chamber for 24 hours and then placed in a greenhouse gave positive results in three days on tomato, beet, carrot, eggplant, cucumber, cantaloupe, watermelon, and snap and Lima beans, but lettuce remained unaffected.

The disease has always been observed in Florida during the summer rainy period, when the daily maximum and minimum temperatures

are about 90° and 70°, respectively. It frequently destroys the late spring crop in June when the summer rains begin early, and the early autumn crop in November, when the rainy season is prolonged. The fungus survives from one season to the next on plant debris in cultivated fields, along fence rows and ditches, and on living plants. The sclerotia are disseminated by natural agencies, such as wind, rain, running water, and heavy dews, mechanical means during cultivation, animals, and human beings. In laboratory tests it remained viable for ten months in culture dishes at room temperature.

Control measures suggested comprise crop rotation and the non-cultivation of beans from 1st June until 1st September in fields where previous bean crops have been infected.

KREUTZER (W. A.). **Host-parasite relationships in pink root of Allium cepa L. I. The pigment of Phoma terrestris.**—*Phytopathology*, xxix, 7, pp. 629–632, 1939.

In some Colorado soils onion roots infected by *Phoma terrestris* [*R.A.M.*, xvii, pp. 302, 831] showed a yellow to yellowish-brown discoloration instead of the pink colour generally associated with the disease. Cultural studies [which are described] showed that this variation was not associated with temperature or nutritional factors, but was reproduced by changes in the P_H value of the medium. In preliminary tests, using diseased pink roots and agar mats on which *P. terrestris* was growing, the colour changed from red or reddish-purple at P_H 8·5 to yellow or yellowish-brown at 4·5. When the pigment was extracted from the hyphae and used in solution the change took place within the range P_H 7·00 to 7·86. The pigment could be precipitated from an alkaline solution by the addition of saturated sodium sulphate and redissolved in a 2 per cent. solution of emulsin. As the material appears to be slightly hydrolysed by the enzyme emulsin at least part of the molecule would seem to be of the nature of a β-glucoside.

WIANT (J. S.), IVANOFF (S. S.), & STEVENSON (J. A.). **White rust of Spinach.**—*Phytopathology*, xxix, 7, pp. 616–623, 2 figs., 1939.

This is an expanded account of a paper already noticed [*R.A.M.*, xviii, p. 367].

IWATA (Y.). **Pseudoperonospora cubensis (Berk. et Curt.) Rostow. on Trichosanthes japonica.**—*Ann. phytopath. Soc. Japan*, viii, 4, pp. 336–338, 2 figs., 1939. [Japanese. Abs. in *Biol. Abstr.*, xiii, 7, p. 1206, 1939.]

Pseudoperonospora cubensis is recorded for the first time on *Trichosanthes japonica*, and notes are given on the symptoms produced on the new host, the morphology of the fungus, and the positive results secured in cross-inoculations between *T. japonica*, cucumbers, and other Cucurbitaceae.

WOOD (F. C.). **Studies on 'damping off' of cultivated Mushrooms and its association with Fusarium species. II.**—*Phytopathology*, xxix, 8, pp. 728–739, 3 figs., 1 graph, 1939.

Continuing his studies at Trinity College, Cambridge, on the relation

of *Fusarium* spp. to damping-off of cultivated mushrooms (*Agaricus campestris*) [*Psalliota* spp.] in England [*R.A.M.*, xvi, p. 434], the writer ascertained, by experiments with the patented spawn jar of the Chester County (Pennsylvania) Mushroom Laboratories, that a mutual antagonism exists between the brown mushroom strain used in the tests and *F. culmorum*, *F.* [*solani* var.] *martii*, *F. oxysporum*, *F. flocciferum*, and *F. dianthi* in the inoculated maize meal-sand casing soil. Once the casing soil becomes permeated by these organisms the growth of the mushroom mycelium is suppressed. At the junction of the spawn and the casing soil a deep brownish layer was formed, below which the normally bluish-white spawn assumes a reddish tinge. The growth rates *F. oxysporum* and *F. solani* var. *martii* to *P.* spp., were represented by rates of 3:1 and 4:1 respectively, and other species of *Fusarium* gave similar results. When a malt agar plate was inoculated with *Fusarium* and *Psalliota* on opposite sides little or no antagonism could be perceived, but when the mushroom was allowed to grow to a colony of 2 cm. in diameter before inoculation with the *Fusarium* antagonism was pronounced. In the case of *F. culmorum* the area of antagonism was outlined by the deposition of a brilliant scarlet pigment, growth ceasing at a distance of 2 mm. from the mushroom.

In experiments with *F. culmorum* the presence in the casing soil of toxins from filtrates of cultures on Richard's solution caused the same symptoms and similar yield reductions as the living fungus, but the toxins had a stimulatory rather than inhibitory effect when their incorporation was delayed until the beginning of spawn growth.

The thermal death points on Dox's agar of *F. solani* var. *martii* and *F. oxysporum*, the two species most commonly associated with damping-off, were found to be 47° to 48° and 55° C., respectively, for a 20-minute exposure, the corresponding temperature for five minutes being 50° to 51° and 58° to 59°. Similar tests with the other species concerned indicated that the casing soil may be freed from fungal contamination by 20 to 30 minutes' exposure to steam heat at a temperature of 60° to 70°.

BRANAS (J.). **Chronique. Évolution du mildiou dans la vignoble méridional en 1939.** [Current notes. Development of mildew in southern vineyards in 1939.]—*Progr. agric. vitic.*, cxii, 30, pp. 53, 57, 1939.

A detailed account is given of observations on the development of vine mildew [*Plasmopara viticola*] made during 1939 in the south of France. Temperature did not appear to be an important factor locally in determining the duration of the incubation period, the chief influence being the water content of the tissues. Aramon vines bound up tightly from 6th June, and therefore containing more water than others not so treated, showed lesions three times as large as those on adjacent vines not so tied. At the end of the season, yellowing leaves containing much water were attacked, while drier leaves were unaffected. Varieties with highly turgescent organs were more affected than others. Some relation probably exists between severity of attack, size of lesions, duration of incubation, and the degree of turgescence of the tissues.

OSTERWALDER (A.). **Prüfung von Peronospora-Bekämpfungsmitteln im Sommer 1938.** [The testing of preparations for *Peronospora* control in the summer of 1938.]—*Schweiz. Z. Obst- u. Weinb.*, xlviii, 14, pp. 244–249, 1939.

Of the preparations tested at Wädenswil, Switzerland, in 1938 for the control of vine *Peronospora* [*Plasmopara viticola*], 1 per cent. cuprenox [*R.A.M.*, xvi, p. 773], a bluish-green paste containing copper oxychloride and manufactured by Agricola S.A. Bussigny (Vaud), gave the most satisfactory results. Six applications between 3rd June and 3rd August effectively combated the disease on Räuschling.

Plantesygdomme i Danmark 1938. Oversigt, samlet ved Statens plantepatologiske Forsøg. [Plant diseases in Denmark in 1938. Survey of data collected by the State Phytopathological Experiment Station.]—*Tidsskr. Planteavl*, xliv, 1, pp. 1–53, 5 figs., 2 graphs, 1939.

This report, prepared on the usual lines [*R.A.M.*, xvii, p. 87], contains among other items of interest the following information presented by E. Gram, H. R. Hansen, Gudrun Johansen, and Anna Weber. Boron deficiency of beets, though not widely prevalent, was troublesome locally, reducing the dry weight of Tystofte VII sugar beets in south Jutland, for instance, from 20·7 to 17·8 per cent.

Potato leaf roll and mosaic were observed throughout the country [ibid., xvii, p. 338], the latter being specially prevalent. At Tylstrup the Karma, Preussen, Edeltraut, and Aal varieties suffered severely from mosaic, while Juli, Kaiserkrone, Gustaf Adolf, and Tylstrup Odin were only slightly affected. Systematic counts of the incidence of mosaic and leaf roll in 114 fields in the Copenhagen district yielded the following comparative varietal data: King Edward 25 and 0 per cent., respectively, Bintje 31 and 0, Juli 28 and 12, Svaløf Birgitta 47 and 6, Sydens Drønning [Southern Queen] 8 and 5, and Magnum Bonum 37 and 2. Wart disease (*Synchytrium endobioticum*) was observed in four new administrative areas. *Cercospora concors* [ibid., xvii, p. 60] was found on the Up-to-Date, Deodara, and Goldperle potato varieties.

Repeated applications of Bordeaux mixture to bare asparagus stems, before the first signs of new growth, proved effective against rust (*Puccinia asparagi*) [ibid., xviii, p. 649].

The infection of wheat by *Ophiobolus graminis* [ibid., xviii, p. 386] was promoted by the practice of ploughing-under twice instead of once.

Relatively little attention is paid to the disinfection of rye seed-grain (only 13 per cent. of the fields in the Roskilde district treated as against 95 per cent. of wheat), and some severe attacks of flag smut (*Urocystis occulta*) were reported in consequence.

Grey speck of oats, associated with manganese deficiency [ibid., xviii, p. 668], occurred in a devastating form in certain areas and also affected winter wheat on clay soil in the Horsens district. In one locality the beneficial effects of fertilizing with manganese sulphate (75 or 150 kg. per hect.) in experimental plots laid down in 1935 are still persisting, appreciable increases in the mangold, barley, and clover crops having been obtained in 1936, 1937, and 1938, respectively.

Zantedeschia [*aethiopica*] plants from a Jutland nursery-garden showing typical mosaic symptoms [ibid., xiv, p. 587] recovered almost completely after a year in the greenhouse.

WOOD (JESSIE I.) & NANCE (NELLIE W.). **Diseases of plants in the United States in 1937.**—*Plant Dis. Reptr, Suppl.* 110, 319 pp., 12 graphs, 23 maps, 1939. [Mimeographed.]

This report [cf. *R.A.M.*, xvii, p. 589] contains valuable information on the incidence and distribution of, and losses caused by, diseases affecting the cereal, fodder, vegetable, fruit, sugar-cane, and miscellaneous crops in the United States in 1937.

Fifty-first Annual Report of Purdue University Agricultural Experiment Station, Lafayette, Indiana, for the year ending June 30, 1938.—117 pp., 34 figs., 1 graph, [? 1939].

The following are among the items of phytopathological interest occurring in this report [cf. *R.A.M.*, xv, p. 633]. Analyses by H. R. Kraybill and D. M. Doty of wheat samples severely infected by black stem rust [*Puccinia graminis*] generally revealed abnormally high percentages of protein, ash, and fibre and a low starch content as compared with relatively sound material.

Ascospores of the apple scab fungus [*Venturia inaequalis*] are reported by R. C. Baines to have been liberated on 3rd March, 1938, the earliest date yet recorded for Indiana, and by the petal-fall stage some 90 per cent. had been discharged in the southern part of the State.

In R. W. Samson's experiments to determine the part played by tomato seed in the transmission of *Macrosporium* [*Alternaria*] *solani* [ibid., xviii, p. 785], 700 seeds were extracted from rotted fruits, sterilized, and plated out on agar, where only two gave rise to typical colonies of the fungus. In another test involving 7,700 seeds from a canning factory, again only two carried the pathogen internally, and this source of infection in commercial seed is not likely, therefore, to be of any significance. The same worker, with L. C. Shenberger, found that an effective seed treatment for tomato was five to ten minutes' immersion of the seed in 1 in 24,000 or 1 in 32,000 ethyl mercury phosphate; no appreciable deterioration was observed after 18 months' storage. Where damping-off [*Pythium*, *Phytophthora*, and *Rhizoctonia* spp.: ibid., xviii, p. 421 *et passim*] occurred the treated seed gave better results than untreated. Encouraging progress has been made by E. C. Stair in the development of Indiana Baltimore tomatoes resistant to wilt (*Fusarium*) [*bulbigenum* var. *lycopersici*: ibid., xviii, p. 788], one 1936 selection remaining entirely healthy in 1937 in a field where the susceptible varieties were destroyed.

Coleosporium crowellii [ibid., xviii, p. 2] has been determined as the agent of a new disease of limber and piñon pines [*Pinus flexilis* and *P. edulis*] in New Mexico. The rust is of unusual morphology, producing long teleutospore chains on the needles, closely simulating the aecidia of other needle rusts.

None of the China asters [*Callistephus chinensis*] (over 400) tested by E. R. Honeywell during the last ten years has shown any evidence

of permanent immunity from wilt (*F.*) [*conglutinans* var. *callistephi*: ibid., xvii, p. 247].

Using Wildman's technique [ibid., xvi, p. 536], the incidence of mould mycelia in sour cream butter was found to be influenced by seasonal conditions, the percentage of samples having less than 20 positive fields rising from 9·7 in September to 98 in February.

FAWCETT (G. L.). **Departamento de Botánica y Fitopatología. *Ex* Memoria anual del año 1938.** [Department of Botany and Pathology. *Ex* Annual Report for the year 1938.]—*Rev. industr. agríc. Tucumán*, xxix, 1–3, pp. 36–39, 1939.

This report [cf. *R.A.M.*, xviii, p. 237] contains the following items of phytopathological interest in addition to information already presented from another source. Sugar-cane in Tucumán suffered from two types of red rot during the period under review, one caused by *Cephalosporium sacchari* [ibid., xviii, p. 625], a secondary pathogen following infestation by *Diatraea saccharalis*, and the other due to *Colletotrichum falcatum*.

Pomelo and lemon fruits developed a chestnut-coloured spotting associated with a species of *Septoria*, probably *S. citri* [ibid., xviii, p. 671], the lemons being shed before maturity. Inoculation experiments gave positive results only on green fruits in a very damp atmosphere at 25° to 30°.

Promising results in the control of 'corcova' [hunchback] of tobacco [ibid., xviii, p. 202] were obtained by spraying the foliage with lead arsenate, which repels the insect vector [*Frankiniella paucispinosa*] of the disease.

Leaf curl of tomato appears to be caused by the identical virus responsible for the same disease in beets [ibid., xviii, p. 237], and is likewise transmissible by *Agallia* [*Ceratagallia*] *sticticollis*. The North American curly top of beets, on the other hand, is evidently a distinct disease, judging from experiments carried out by the Washington Department of Agriculture with Argentine material, in which the United States vector [*Eutettix tenellus*] failed to convey the virus from infected to healthy plants.

CASTELLANI (E.). **Considerazioni fitopatologiche sull' Africa Orientale Italiana.** [Phytopathological notes on Italian East Africa.]—*Agricoltura colon.*, xxxiii, 8, pp. 486–492, 5 figs., 1939.

The author states that in some of the less arid regions of Italian East Africa he observed *Sclerospora sorghi* [*R.A.M.*, xiv, p. 80] on maize and *Pennisetum typhoideum*, *Phytophthora palmivora* on coconut palm, *Bacterium malvacearum* on cotton, *Bact. solanacearum* on castor [*Ricinus communis*] and groundnut, and *Phytophthora colocasiae* on a member of the Araceae.

GEIGER (W. B.) & ANDERSON (R. J.). **The chemistry of Phytomonas tumefaciens. I. The lipids of Phytomonas tumefaciens. The composition of the phosphatide.**—*J. biol. Chem.*, cxxix, 2, pp. 519–529, 1939.

An examination was made of the lipids of *Phytomonas* [*Bacterium*] *tumefaciens* [*R.A.M.*, xvii, p. 798] on two synthetic media, one con-

taining glycerol and the other sucrose, at the Sharp and Dohme Biological Laboratories, Glenolden, Pennsylvania. On the former the bacteria yielded only 2 per cent. total lipids, of which about 44 per cent. was phosphatide, the corresponding figures for the latter being 6 and 64 respectively. The phosphatides consisted of about equal parts of lecithin and cephalin. Differences [which are described] were also detected between the fatty acids of the phosphatides from bacteria grown on the two media.

STAPP (C.). **Bakterielle Pflanzenerkrankungen.** [Bacterial plant diseases.]—*Zbl. Bakt.*, Abt. 1 (Orig.), cxliv, 1–5, pp. 94–108, 16 figs., 1939.

A summary is given of the available knowledge concerning a number of well-known bacterial diseases of plants, references to all of which have repeatedly appeared in this *Review*.

DILLON WESTON (W. A. R.). **Modern methods of seed disinfection.**—*Ann. appl. Biol.*, xxvi, 3, pp. 636–640, 1939.

In this paper the author discusses modern methods of seed treatment against cereal diseases, distinguishes between seed disinfectants and seed protectives, and disposes of the criticisms sometimes levelled against the organo-mercury dusts on the grounds of expense and the danger to the workers involved in their use. [Much of this information appears in a more popular form in *J. Minist. Agric.*, xlvi, 6, pp. 593–601, 1939.]

Report of the Sixth Hard Spring Wheat Conference, 1939.—71 pp., Northwest Crop Improvement Association, Minneapolis, Minnesota, 1939. [Mimeographed.]

Speaking at the Sixth Hard Spring Wheat Conference held at Minneapolis in February, 1939, R. W. Smith presented evidence that wheat varieties badly attacked by stem rust [*Puccinia graminis*: *R.A.M.*, xviii, p. 660] were more severely injured by grasshoppers than those slightly rusted.

E. W. Hanson shows in tabular form the resistance or susceptibility of the spring wheat varieties studied at St. Paul, Minnesota, to nine major diseases. The most difficult wheat disease problems in Minnesota are scab [*Gibberella saubinetii*: ibid., xviii, p. 661] and root rot (chiefly *Helminthosporium sativum* and *Fusarium* spp.) [ibid., xviii, p. 515], to which none of the commercially grown or new varieties shows any appreciable resistance. Scab causes very serious losses in the southern part of the State whenever favoured by weather conditions, and losses from root rot are incurred every year, amounting, not uncommonly, to 30 to 50 per cent. in some fields. High temperatures favour infection, and early planting is therefore recommended. Deep planting favours seedling blight [*G. saubinetii*]. More blight tended to develop in the poorer samples, in which both stand and vigour were inferior, than in the better lots of bread and durum wheats. Seed treatment greatly reduced blight and the percentage of dwarfed plants. Treatment of the poorer lots gave greater benefits than treatment of the better lots. Crop rotations including wheat for two or more years in succession

had more blight than any other rotations. Least blight resulted in those sequences where wheat followed potatoes or a leguminous crop.

M. N. Levine stated that the 1938 epidemic of leaf [brown] rust [*P. triticina*] in the United States was the worst on record [ibid., xviii, p. 663]. Marquis now appears to be entirely susceptible, probably because of the predominance of races 9 and 15 in the last few years, and their great virulence on most early hard red spring wheats.

E. C. Stakman stated that race 56 of *P. graminis* [ibid., xviii, p. 94], first found in 1928, has increased steadily, until in 1938 over 60 per cent. of all the stem rust isolates from wheat in the United States belonged to this race, or 83 per cent. of the collections. Race 56 averaged 72 per cent. of all collections in the spring wheat States. Race 34 has decreased since 1934. Race 56 was not found in southern Mexico, where almost all the rust belonged to races 38 and 59. Nine races, including 56, were found in northern Mexico. Race 56 is very virulent on Ceres, and has apparently been responsible for the downfall of this variety. Of the rust collections made in 1938, 94 per cent. were not virulent on Thatcher. Other races found in the spring wheat area in 1938 were 38, 19, and 17, of which the first two were virulent on durum wheats. Races attacking Vernal emmer included 15, 69, 97, and 53.

KALE (G. T.). **Breeding rust resistant Wheat.**—*Int. Rev. Agric.*, xxix, 10, pp. 371T–381T, 1938; xxx, 9, pp. 325T–330T, 1939.

For each of the European countries, the United States, Canada, Russia, South Africa, Australia, and India, notes are given on the damage caused in recent years by wheat rusts (*Puccinia graminis tritici*, *P. glumarum*, and *P. triticina*), together with accounts of the relative prevalence of the different species and their physiological races in the same countries, and the defensive measures adopted against these diseases. The paper concludes with a short discussion on breeding for rust resistance. A bibliography of 103 titles is appended.

TENNENT (R. B.). **Mercurial dusting of seed Wheat. Effect on germination.**—*N.Z. J. Agric.*, lix, 2, pp. 133–134, 1939.

The author adduces evidence showing that when wheat seeds treated against stinking smut [*Tilletia caries* and *T. foetens*: *R.A.M.*, xviii, p. 94] with mercury dusts (e.g., agrosan and ceresan) are sprouted on paper such treatment may reduce germination, though the reduction is practically negligible in the case of thoroughly conditioned seed; when, however, germination is measured by the results obtained from sowing seed in the soil, no depression occurs, treatment, in fact, being likely to increase germination. Dusted seed stored for four months showed no reduction in germination, as compared with untreated seed similarly stored.

SADAVISAN (T. S.). **Succession of fungi decomposing Wheat straw in different soils, with special reference to Fusarium culmorum.**—*Ann. appl. Biol.*, xxvi, 3, pp. 497–508, 2 graphs, 1939.

In investigations carried out at Rothamsted the author studied the succession of fungi developing on buried wheat straw in four arable

soils, an allotment soil, and a glasshouse compost, both natural, untreated straw and straw autoclaved in a 2 per cent. solution of sodium nitrate being used. The dominant colonizers found were *Fusarium culmorum, Mucor* spp., and *Penicillium* spp., and detailed records were made of these only, though fungi belonging to eleven other genera were also found. In two experiments [which are described], *F. culmorum* and *Mucor* spp. were dominant in the earlier stages of straw colonization but gave way to *Penicillium* spp. in the later stages. The nitrogenous treatment of the straws encouraged the development of *Penicillium* spp. at the expense of *F. culmorum* and *Mucor* spp.

The pathogenicity of the *F. culmorum* isolates to wheat seedlings was established by inoculation tests. The data obtained show that *F. culmorum* should be included in Reinking and Manns's group of soil-inhabiting species of *Fusarium* [*R.A.M.*, xiii, p. 128] or true soil fungi.

Olsen (C.). **The employment for water culture experiments of distilled water containing traces of copper.**—*C.R. Lab. Carlsberg*, Sér. chim., xxiii, 5, pp. 37–44, 1939.

In connexion with a series of experiments at the Carlsberg Laboratory, Copenhagen, it is mentioned that barley grown in culture solutions containing traces of copper (0·6 mg. per l.) was not attacked by mildew [*Erysiphe graminis*], which developed, on the other hand, on the control plants in ordinary distilled water solutions. All the plants throve better in the copper-containing solutions; they were found to contain about twice as much of the element as those in the control series.

Murphy (H. C.). **Effect of crown and stem rusts on the relative cold resistance of varieties and selections of Oats.**—*Phytopathology*, xxix, 9, pp. 763–782, 4 figs., 1939.

The outstanding results of the writer's experiments in Iowa on the effect of crown and stem rusts (*Puccinia coronata* and *P. graminis*) on the relative cold resistance of varieties and selections of oats have already been noticed [*R.A.M.*, xv, p. 486], and are here expanded and tabulated. Plants in the four-leaf stage, whether infected or healthy, were less resistant to cold than equally hardened ones with six leaves. The hardiness index of plants of 21 varieties with 20 to 80 per cent. crown rust was 13 to 68 per cent. lower than that of healthy ones under similar conditions, the corresponding reduction for 15 to 85 per cent. stem rust being 9 to 91 per cent. Of 21 oat varieties tested, the hardiest, on the basis of tests with rust-infected, shaded, and control plants, were Hairy Culberson, Culberson, Culred, Coker 32–1, Fulghum (winter types, C.I. 2498 and 2499), Bicknell, Winter Turf (C.I. 3295 and 3296), and Sporen.

Hadden (S. J.). **A method of inducing an epiphytotic of rust in grain breeding nurseries.**—*J. Amer. Soc. Agron.*, xxxi, 8, pp. 728–729, 1 fig., 1939.

Earlier, more severe, and more uniform outbreaks of crown rust of oats [*Puccinia coronata*] have been induced during the past three years at the Georgia Agricultural Experiment Station by planting all alley-

ways and borders with a susceptible variety, such as Winter Turf. Plants of the same variety heavily inoculated in the greenhouse during the late winter are set at intervals throughout the borders in early spring. A wooden frame carrying cotton sheeting is placed over the rusted and adjacent plants and for several consecutive evenings the ground and covering thoroughly wetted. As soon as infection is well established the frame may be moved to another centre. Infection thus induced usually spreads rapidly from these initial foci throughout the susceptible border variety.

VOLKART (A.). **Der Roggensteinbrand (Tilletia secalis [Corda] Kcke.).** [Rye bunt (*Tilletia secalis* [Corda] Kcke.).]—*Ber. schweiz. bot. Ges.*, xlix, pp. 495–503, 1939.

In July, 1930, the writer detected the presence of *Urocystis occulta*, not hitherto recorded in Switzerland, on a single rye plant in Leventina, Ticino, and at the same time *Tilletia secalis* [*R.A.M.*, xii, pp. 549, 616] was observed on others in the same locality and elsewhere in the canton. Previous records of rye bunt in the country are regarded as doubtful.

T. secalis is capricious in its development. In the restricted area involved in the Ticino, for instance, it was prevalent in 1930, much rarer in 1931 (under 3 per cent.), absent in 1932, and again abundant in 1934. The spore diameter of *T. secalis* exceeds that of *T. tritici* [*T. caries*], the average figures of seven collections (including three herbarium specimens from Czechoslovakia, U.S.S.R., and Germany) of *T. secalis* varying from $21{\cdot}63 \pm 0{\cdot}08$ to $24{\cdot}35 \pm 0{\cdot}10\mu$; and of ten of *T. caries* (six on wheat and four on spelt, all from Switzerland), from $19{\cdot}14 \pm 0{\cdot}11$ to $20{\cdot}53 \pm 0{\cdot}12\mu$. Unlike *T. caries*, *T. secalis* cannot be induced to germinate under ordinary laboratory conditions, none of the writer's very numerous experiments having been certainly successful, though on one occasion sporidium-like structures, 44 to 110 by 4 to 5 (average 79·4 by 4·45)μ, with up to six septa, were formed on acid loam after 23 days. Similar behaviour is characteristic of *T. guyotiana* Har., another new record for Switzerland, collected on *Bromus mollis*.

In cross-inoculation experiments with *T. secalis* and *T. caries* the former in one series caused 0·6 per cent. infection of Rothenbrunner rye but gave entirely negative results on wheat in all the tests; conversely, *T. caries* failed to attack rye while profusely infecting its own host. Though *T. secalis* may possibly be able to pass from rye to wheat under other conditions, it is clear from the information here presented that the two species of bunt are totally distinct.

KOEHLER (B.). **Crazy top of Corn.**—*Phytopathology*, xxix, 9, pp. 817–820, 1 fig., 1939.

'Crazy top' is the name applied to a remarkable abnormality of maize causing heavy losses in certain localized areas of Illinois, the affected plants tending to occur in groups in more or less depressed areas in fields on moderately to highly fertile soils in both the north and south of the State. Floral organs are partially or entirely absent and are replaced by vegetative shoots. In some instances of tassel derangement the ear shoots bear grain, and among the leafy prolifera-

tions of the tassel are a few branches with apparently normal male florets. In one field of hybrids nearly half the plants showed excessive jointing of the upper half of the stalk instead of bunching of the tops; in this form of the disorder leafy branches were produced instead of ears. Comparable malformations were noted in *Echinochloa crus-galli* and *Setaria viridis* in one of the severely diseased maize areas. The etiology of the disturbance is obscure.

GOIDÀNICH (G.). **Ricerche sul deperimento del Sorgo zuccherino verificatosi in Italia nella primavera del 1938.** [Researches on the wilt of saccharine Sorghum observed in Italy in the spring of 1938.]—*Boll. Staz. Pat. veg. Roma*, N.S., xix, 1, pp. 1–74, 4 pl. (2 col.), 29 figs., 1939.

A detailed account is given of investigations carried out on a wilt of saccharine sorghum causing heavy losses in Italy in 1938 and found to be due to unfavourable environmental conditions predisposing the plants to attack by red stripe disease [*R.A.M.*, xviii, p. 518] and red leaf spot [loc. cit.], of which the latter appeared to be caused by insect infestation.

KENDRICK (J. B.) & BRIGGS (F. N.). **Pythium root rot of Milo and the development of resistant varieties.**—*Bull. Calif. agric. Exp. Sta.* 629, 18 pp., 7 figs., 1939.

An account is given of the sorghum root rot caused by *Pythium arrhenomanes* [*R.A.M.*, xvi, p. 807; xviii, p. 517], which has been recognized in the upper delta region of the Sacramento River, California, since 1935, and of the greenhouse and field trials carried out with a view to the development of resistant varieties. Double Dwarf Darlo is highly resistant as well as productive, comparing favourably in these respects with Double Dwarf Yellow milo, but it has the drawbacks of maturing a fortnight later in some localities and of being relatively intolerant of alkali and heat. Promising results have been obtained in the selection of almost 100 per cent. resistant strains of Double Dwarf Yellow, Dwarf White, and Heileman from heavily infected commercial plantings, and arrangements are being made for their increase and distribution through an approved State agency.

EL-HELALY (A. F.). **Studies on the control of kernel smut of Sorghum.**—*Bull. Minist. Agric. Egypt* 233, 22 pp., 3 figs., 1939.

In experiments carried out at Dokki, Egypt, during 1935–6, early sown plants of sorghum were more severely attacked by kernel smut (*Sphacelotheca sorghi*) [*R.A.M.*, xviii, p. 588] than later sown ones, temperature being apparently the decisive factor. Infection only occurred from 15° to 35° C. since within these limits both the grain and the spores are capable of germination. In early sowings the full range of these temperatures obtains and consequently severe attacks can take place, whereas with the gradual rise in temperature the range becomes so limited that the disease is very reduced in later sowings. Throughout these experiments, with only one exception, the 'afir' method of sowing [ibid., xviii, p. 171] gave a considerably smaller percentage of diseased plants than the 'herati'. This is tentatively

attributed to the more favourable soil temperatures and humidity in the 'herati', or to the fact that watering, which follows sowing in the 'afir' method, may remove the spores adhering to the seed coat.

In seed disinfection tests in the laboratory the toxicity of sulphur and copper carbonate was increased enormously by using soil filtrate instead of distilled water. In field trials complete control without any adverse effect on seed germination and growth was obtained either by mixing the seed with agrosan G (2·5 or 5 gm. per kg.) or treating it with uspulun or germisan (1 or 2 per cent. solution for 15 mins.). Sulphur (5 to 10 gm. per kg.) gave partial control, while the cheapest and most effective results were achieved with clean seed. The cost of treatment with any of the recommended fungicides, however, is stated to be practically negligible.

Rudolph (B. A.) & Harrison (G. H.). **Attempts to control Verticillium wilt of Cotton and breeding for resistance.**—Abs. in *Phytopathology*, xxix, 8, pp. 753, 1939.

The heavy soils of the San Joaquin Valley, California, where cotton has been grown continuously for the last ten years, have become extensively (and in places totally) permeated by *Verticillium albo-atrum* [*R.A.M.*, xvii, p. 504], the selection of strains resistant to which has been successfully accomplished within the varieties Cooke 307–6, Mexican Big Boll, Kekchi, Tuxtla, and Missdel. Strains of Stoneville and Acala, while not resistant, are prolific under heavy infection. The American-Egyptian types are highly resistant to *V. albo-atrum*, and an attempt is in progress to transfer the resistance of Pima to Acala by means of back-crossing.

Ezekiel (W. N.). **Girdling of Cotton plants as affecting survival of Phymatotrichum omnivorum.**—Abs. in *Phytopathology*, xxix, 8, p. 753, 1939.

In preliminary experiments [in Texas] suggested by the work of R. Leach on *Armillaria mellea* [*R.A.M.*, xvi, p. 564], cotton plants girdled on 29th July, 1938, developed bronzing of the foliage within 11 days and a third of the total were dead in less than a month. The necrotic process coincided with a rapid decrease of alcohol-soluble solids and total sugars in the roots. *Phymatotrichum omnivorum* was not recovered in a viable form from the roots of girdled plants after three, five, or eight weeks, whereas the fungus readily developed from those of the untreated controls. In another test started on 3rd September, girdling failed to produce any change in the aerial organs of cotton plants or to impair the viability of *P. omnivorum* on the roots, the effects of girdling being apparently associated exclusively with the period of rapid growth of the host.

King (C. J.) & Barker (H. D.). **An internal collar rot on Cotton.**—Abs. in *Phytopathology*, xxix, 8, p. 751, 1939.

A fungus characterized by dark brown, multiseptate chlamydospores and endogenous cylindrical spores, and apparently identical in all morphological characters with *Thielaviopsis basicola*, is the agent of a hitherto unreported root rot of cotton, manifested by a purplish-black discoloration of the infected tissues, which has been observed

in the Sacaton district of Arizona for several years. The disease causes heavy mortality among seedlings when the soil is cold and wet, and a relatively quiescent period during the hot weather is followed by renewed activity in the late summer. Inoculation experiments with *T. basicola* resulted in the typical symptoms of the rot (except for the death of mature plants), the fungus being recovered in culture. American-Egyptian varieties are more susceptible than upland. *T. basicola* persists in the soil for years, but its rate of spread is slow.

Annual Report of the Indian Central Cotton Committee, Bombay, for the year ending 31st August, 1938.—160 pp., 1939.

In a note on the Punjab root rot scheme [*R.A.M.*, xiii, p. 697] it is stated that infection by *Rhizoctonia bataticola* [*Macrophomina phaseoli*] and *R.* [*Corticium*] *solani* [ibid., xviii, p. 674] starts on the cotton crops of both native and American varieties at an age of six to eight weeks (end of June). The 83 *A.F.* variety was comparatively resistant in 1938, when the incidence of disease was abnormally high.

Of 88 strains tested at the Parbhani (Hyderabad) Cotton Research Station, 26 showed a fair degree of field resistance to wilt (*Fusarium vasinfectum*) [ibid., xvi, pp. 97, 589]. Six out of 11 strains tested at Latur also proved fairly resistant. There is a great demand for the wilt-resistant *Gossypium neglectum verum* 434, a selection from 262, which is hardy, prolific, and excellent for spinning.

Ciferri (R.) & Redaelli (P.). **Mycotorula vs. Candida: a plea.**—*Mycopathologia*, ii, 2, pp. 73–74, 1939.

After briefly discussing the recent paper by Diddens and Lodder on generic taxonomy in the Mycotoruloideae [*R.A.M.*, xviii, p. 525], the authors state that the reaggregation of asporogenous yeasts with pseudomycelium into two genera, one with blasto-arthrospores (= *Trichosporon*) appears to be useful, but consider that workers' views on the nomenclature of the former group may be difficult to reconcile. Rejecting *Monilia* and *Syringospora* [ibid., xv, p. 581] as names for this group, they adduce their reasons for preferring the generic name *Mycotorula* to *Candida*. These are as follows. *Mycotorula* Will (1916) enjoys priority over *Candida* Berkhout (1923), and this they regard as fundamental. In the second place, the original generic description of *Mycotorula* is better than that of *Candida*. Thirdly, the type species of *Mycotorula* is original, while *Candida* is based on a 'conventional' restoration of an old, not easily recognizable species, *Monilia candida* Bonorden. Further, *Mycotorula* has been used mainly in its original sense, whereas *Candida* has been very extensively used in many divergent senses by different workers. Finally, if *Candida* were adopted, the use of the subfamily name Mycotoruloideae would conflict with the generic name.

Verona (O.). **A proposito della unificazione dei generi delle 'Torulopsidaceae-Mycotoruleae'.** [On the unification of the genera of the 'Torulopsidaceae-Mycotoruleae'.]—*Mycopathologia*, ii, 2, pp. 122–123, 1939. [English summary.]

After stating that he agrees with the view of Diddens and Lodder that the number of genera included in the Mycotoruloideae should be

reduced [see preceding abstract], the author points out that in 1939 he proposed that *Enantiothamnus* and *Mycotoruloides* should be considered subgenera of *Mycotorula* and that *Candida* should be divided into two subgenera, *Eucandida* and *Mycocandida* [ibid., xiii, p. 186]. *Blastodendrion* and *Redaellia* [ibid., xiv, p. 169] were placed next to *Mycotorula* and *Candida*. In 1935, Ciferri and Redaelli transferred *Redaellia* to the Trichosporeae but accepted *Mycocandida* as valid (*Arch. Mikrobiol.*, vi, 1935). The author agrees with this so far as regards *Redaellia*, but considers that *Mycocandida* should be referred to *Candida*. In his opinion, *Blastodendrion* should be suppressed, as it is of doubtful value and the species in it could be placed in *Torulopsis* or perhaps in *Mycoderma*. Thus, of these genera, only *Mycotorula* and *Candida* remain, in the author's opinion, valid. Some species may have characters in common with both, but this occurs less commonly than is supposed, and when it does happen, such characters tend to bring the fungus nearer to one genus than the other. If only one of the two should remain it should be *Mycotorula*, as the name is earlier than *Candida* and better suited to the characters of these yeasts.

Verona (O.) & Malaguzzi-Valeri (O.). **Oidium albicans Robin [Mycotorula albicans (Rob.) Lang. et Tal.] e Monilia pseudotropicalis Castellani [Mycocandida pseudotropicalis (Cast.) Cif. et Red.].** —[*Oidium albicans* Robin [*Mycotorula albicans* (Rob.) Lang. & Tal.] and *Monilia pseudotropicalis* Castellani [*Mycocandida pseudotropicalis* (Cast.) Cif. & Red.].]—*Mycopathologia*, ii, 2, pp. 80–83, 1 fig., 1939. [English summary.]

From cultural, morphological, biochemical, and biological studies of a yeast isolated from the faeces of a child and identified as *Monilia pseudotropicalis* [*R.A.M.*, xvii, p. 319, xviii, p. 525] the authors conclude that the transference of this species to *Mycocandida* as *M. pseudotropicalis* by Ciferri and Redaelli in 1935 is justified. The following synonyms are amongst those listed: *Endomyces pseudotropicalis* Castellani 1910, *Atelosaccharomyces pseudotropicalis* 1918, *Myceloblastanon pseudotropicalis* Ota 1928, *C. pseudotropicalis* Basgal 1931, and *Castellania pseudotropicalis* Dodge 1925 [cf. ibid., xv, p. 367]. An amended description of the fungus is given. Both on solid and liquid media hyphae appear slowly. At first only oval, more or less vacuolate cells are noted, measuring 6·3 to 7·1 by 3·4μ on saccharose agar and 7·1 to 8·8 by 4·4 to 6·3μ on a malt agar. Later on arborescent, budding formations of the *Blastodendrion* type develop, comprising long articulated segments bearing only one terminal blastospore. On Difco glucose agar after 15 days at 24° C. the fungus forms giant, subrotund, white, opaque, creamy, dense colonies with a central boss, occasional radial striae, and a smooth edge. It ferments glucose, levulose, mannose, saccharose, galactose, maltose, lactose, but not raffinose. It assimilates these sources of carbon, and urea, asparagin, peptone, and ammonium sulphate, but not potassium nitrite or nitrate. It does not liquefy gelatine or coagulate milk. It is pathogenic to laboratory animals and man. The species is stated to be distinct from *Mycotorula albicans* [ibid., xvii, p. 817] and *Candida tropicalis* [ibid., xviii, p. 253].

Redaelli (P.), Ciferri (R.), & Cavallero (C.). **Sul presunto Endomyces albicans Vuillemin.** [On the fungus presumed to be *Endomyces albicans* Vuillemin.]—*Mycopathologia*, ii, 2, pp. 116–121, 2 pl., 1939. [English summary.]

A strain of *Monilia* [*Candida*] *albicans* [cf. preceding abstract] from Illinois was found to be morphologically identical with *Endomyces albicans* Vuill. [*R.A.M.*, xviii, p. 253] or *E. vuillemini*. It was characterized by an early and abundant formation of acrogenous chlamydospores. Vuillemin is believed to have taken the chlamydospores of *M. albicans* to be asci and renamed the fungus *E. albicans*, while Landrieu would appear to have used the name *E. vuillemini* to distinguish an asporogenous form of *M. albicans* from *E. albicans*. Vuillemin's original strain, examined by the authors, was found to be asporogenous. They consider that the Illinois strain, Vuillemin's strain, *E.* [*C.*] *krusei*, and probably *E. pulmonalis* and *E. bonaerensis* as well, are all a variety of *Mycotorula albicans*, which they name *Mycotorula albicans* var. *vuillemini* (Landrieu ex Cast. & Chalm.) Red., Cif., & Cav., n.comb., nine species being listed as synonyms, including *E. albicans* Vuill.

Kesteven (H. L.). **The mycotic flora of 'surfer's foot' in Sydney.**—*Med. J. Aust.*, xxvi (i), 11, pp. 420–428, 1939.

The following fungi were isolated in pure culture on Sabouraud's glucose or maltose agar at 35° C. at the Royal Prince Alfred Hospital, Sydney, from the feet of patients suffering from interdigital tinea (misleadingly known as 'surfer's foot'): *Epidermophyton* [*Trichophyton*] *niveum* [ibid., xvi, pp. 179, 535] and its new varieties *closterosporiger* and *coremiger*, *E.* [*T.*] *pedis* [ibid., xviii, p. 678], *E. album* n.sp., *E. flavum* n.sp., *E.* [*T.*] *cerebriforme* [ibid., xviii, pp. 177, 523], *E. macrosporicum* n.sp., *E. interdigitale* var. *rosea* n.var., *E. planum* n.sp., *E. griseum* n.sp., *Ectotrichophyton mentagrophytes* var. *chibaense* Ogata (*Jap. J. Derm.*, xxix, 1929), *Microsporon audouini*, *M. canis* [*R.A.M.*, xviii, p. 393], *Syringospora* [*Candida*] *albicans*, *C. krusei* [ibid., xvi, p. 811 and preceding abstract], *Eutorula excorians* [ibid., xviii, p. 176], a *Cephalosporium* allied to *C. niveolanosum* [ibid., vii, p. 639], and miscellaneous species of *Aspergillus* and yeasts. [The new species and varieties are without Latin diagnoses.]

E. niveum var. *closterosporiger* produces in 16-day-old cultures 3- to 7-septate closterospores, blunted at both ends, 5 to 8 (average 6)μ in diameter, while at 60 days only large, spherical chlamydospores, 10 to 15μ in diameter, were observed. *E. niveum* var. *coremiger* is characterized (24-day-old colonies) by coremia resembling the conidiophores of a small *Penicillium*, with three to five short, oval branchings each bearing one to three aleuriospores, oval (7 to 10 by 2·8 to 3μ) or spherical (3μ in diameter); the basal segments of the coremia measure 11·3 by 3μ and the spherical chlamydospores 5·6μ in diameter. The colonies of *E. album* are snow-white (rose-tinted at two months and pink or cinnamon-brown at 21) and quite opaque; the hyphae average 3μ in diameter, the oval or piriform aleuriophores (attached directly to the hyphae) 3·5 to 2·8μ, and the spherical chlamydospores 8μ (predominantly). *E. flavum* forms colonies of varying shades of yellow at different

ages and is further characterized by spherical aleuriospores, 5 by 3μ, and open spirals with three to six coils (at 18 days). *E. macrosporicum* (isolated from tinea of the scalp) is characterized on maltose agar at seven days by numerous elongated aleuriospores, 8·4 by 3μ, and in older cultures on glucose agar by intercalary chlamydospores, up to 28μ in diameter, and chains of arthrospores 8 to 9μ in length and breadth, developing into large, thick-walled chlamydospores along the length of the hyphae. Old cultures assume a yellow tinge in the centre of the otherwise flat, opaque, white colony and eventually (at 12 months) turn dirty cinnamon-brown. *E. interdigitale* var. *rosea* is stated to differ from the type species only in the colour of the colonies (white and brown zonations with a rose-pink centre) in a 25-day-old culture. *E. planum* forms white, later faintly grey, flat, woolly colonies; on maltose agar the average length of the slender mycelium is 5 to 7·4μ, the parallel-sided closterospores, developing singly or in bunches of up to five, with three to six loculi, measure 31·3 by 8·4μ, and spherical aleuriospores 2·8 to 3μ in diameter. *E. griseum* is characterized by two types of hyphae, one relatively straight, 3 to 4·2μ in diameter, and the other sinuous, 1·5 to 2·3μ, numerous closterospores, 35 to 60 (average 48 to 52) by 6μ, with three to five segments up to 6μ in length, spherical aleuriospores, borne in small, dense clusters on lateral sporophores, 2·5μ in diameter, and spherical arthrospores, 3·5μ in diameter; the colour of the colonies ranges from grey to dusky rose-pink or citron-yellow; a 13-day-old culture on glucose agar is concentrically zonate with fine radiating ridges.

Knighton (H. T.). **A study of Monilia and other yeastlike organisms found in the oral cavity.**—*J. dent. Res.*, xviii, 2, pp. 103–125, 1939.

Among the 105 fungi isolated from the oral cavities of 146 persons at the Louisville (Kentucky) School of Medicine were *Monilia* [*Candida*] *albicans* (69), *M. candida* [*C. vulgaris*: *R.A.M.*, xvii, p. 676] (5), *M.* [*C.*] *krusei* [see preceding abstract] (4), *M. mortifera* [ibid., xvi, p. 811] (2), and two strains of *M.* [*C.*] *parapsilosis* [loc. cit.], one forming acid from sucrose and coagulating milk (4) and the other negative in both these respects (3). *C. albicans* gave positive results in inoculation experiments on rabbits. There was no evidence that the yeast-like fungi were associated with any pathological conditions of the oral cavity in the persons under observation.

Cottini (G. B.). **Un caso di 'Lingua nigra et pilosa' con isolamento di Mycotorula guilliermondi (Cast.) n.comb.** [A case of 'lingua nigra et pilosa' with isolation of *Mycotorula guilliermondi* (Cast.) n.comb.] —*Mycopathologia*, ii, 2, pp. 75–79, 1 pl., 1939. [English summary.]

From a case of so-called 'lingua nigra et pilosa' (melanoglossitis) affecting the tongue of a 21-year-old male patient in Catania, Sicily, the author isolated a fungus (which he considers as probably saprophytic) identified by Redaelli as *Monilia guilliermondi* [*R.A.M.*, xv, p. 502], but renamed *Mycotorula guilliermondi* (Castellani) Cottini & Redaelli, n.comb.

Ghosh (L. M.). **A case of moniliasis with a secondary allergic patch or 'moniliide'.**—*Indian med. Gaz.*, lxxiv, 8, pp. 476–478, 3 figs., 1939.

The writer describes a case of vulvovaginitis, with secondary manifestations between the toes and on the right arm, caused by *Monilia* [*Candida*] *paratropicalis* [*R.A.M.*, iv, p. 737] in a 20-year-old Hindu woman.

Blende (O. J.). **Ringworm of feet: prevention of infection.**—*Northw. Med., Seattle*, xxxviii, 7, pp. 255–257, 1 fig., 1939.

In an article dealing mainly with the prophylaxis of ringworm of the feet, especially among college students, disorders of this nature are stated to have increased by some 400 per cent. during the last two decades in the United States. At the Seattle (Washington) Pacific College in 1938, 76 (87·5 per cent.) of the male students gave positive evidence of infection by various species of *Trichophyton* and *Epidermophyton*, *E.* Kaufmann-Wolf [*R.A.M.*, xvi, p. 809; cf. also xviii, p. 313] being present in 75 per cent. of the cases.

MacKinnon (J. E.). **Aspergillus terreus Thom., parasito del hombre** [*Aspergillus terreus* Thom., a parasite of Man.]—*Mycopathologia*, ii, 2, pp. 127–129, 1 fig., 1939. [English summary.]

A fungus isolated from the ear of a woman in Montevideo, was identified in culture as *Aspergillus terreus* [*R.A.M.*, xv, p. 20], a fungus apparently of common occurrence under Montevideo conditions.

Froilano de Mello (I.) & Fernandes (L. A.). **Onychomycose du medius et annulaire dûe à une levure du genre Torulopsis Berlese 1894.** [Onychomycosis of the middle and ring fingers due to a yeast of the genus *Torulopsis* Berlese 1894.]—*Mycopathologia*, ii, 2, pp. 124–126, 1939.

From lesions on the middle and ring fingers of the left hand of a female patient at Nova Goa the authors isolated an unidentified species of *Torulopsis*, which clinical evidence showed to be parasitic.

Marzollo (E.). **Paronychie und Onychie mit eigenartiger Färbung der Nagelplatten, verursacht durch Cryptoccocus interdigitalis Pollacci und Nannizzi.** [Paronychia and onychia, with peculiar coloration of the nail-beds, caused by *Cryptococcus interdigitalis* Pollacci & Nannizzi.]—*Arch. Derm. Syph., Berl.*, clxxviii, 4, pp. 381–394, 3 figs., 1939.

A detailed account is given of a case of paronychia and onychia, accompanied by transverse black striations of the nail-beds of two fingers of the right and one of the left hand in a 25-year-old woman at Genoa, Italy. The fungus in pure culture budded off numerous conidia, some thin-walled and circular, 3·5 to 5·5μ in diameter, and others round or oval, 6 to 8·5 by 5·5 to 7μ, with a much thickened membrane: it is identified as *Cryptococcus interdigitalis* [*R.A.M.*, vi, p. 483] and is considered to be directly responsible for the very remarkable disturbance under observation.

Greco (N. V.), Bigatti (A.), Ponce de Leon (S.), & Capurro (J.). **Localización anómala de enfermedad de Kaposi (sarcoma idiopático múltiple hemorrágico), diagnosticada investigando el Cryptococcus haematicon en la sangre.** [An exceptional site for Kaposi's disease (idiopathic multiple haemorrhagic sarcoma) diagnosed by the investigation of the blood for *Cryptococcus haematicon*.]—*Sem. méd., B. Aires*, xlvi, 4, pp. 178–185, 13 figs., 1939. [French summary.]

The writers detected *Cryptococcus haematicon*, associated with Kaposi's disease [*R.A.M.*, xviii, p. 594], in the blood stream of a 36-year-old male Italian resident in Buenos Aires and suffering for three years past from sarcomatosis of the right retroauricular groove.

Shaffer (F. J.), Shaul (J. F.), & Mitchell (R. H.). **Histoplasmosis of Darling : fourth case to be reported in United States.**—*J. Amer. med. Ass.*, cxiii, 6, pp. 484–488, 4 figs., 1939.

A full clinical description is given of a fatal case of Darling's histoplasmosis [*Histoplasma capsulatum*: *R.A.M.*, xviii, p. 456] in an eleven-month-old female infant in Virginia, stated to be the fourth record of the disease for the United States.

Martin (D. S.) & Smith (D. T.). **Blastomycosis (American blastomycosis, Gilchrist's disease). I. A review of the literature. II. A report of thirteen new cases.**—*Amer. Rev. Tuberc.*, xxxix, 3, pp. 275–304; 4, pp. 488–515, 5 pl., 1 graph, 1 map, 1939.

From a perusal of the relevant literature and from the observation of 13 patients of their own, the writers conclude that American blastomycosis or Gilchrist's disease is a distinct clinical entity caused by a specific etiological agent, *Blastomyces* [*Endomyces*] *dermatitidis* [*R.A.M.*, xviii, p. 800], which develops in two forms, cutaneous (chronic) and systemic (acute and fatal).

Debusmann (M.). **Über das Vorkommen eines seltenen Pilzes (Cephalosporium acremonium Corde) im Blut bei tonsillogener Sepsis.** [On the occurrence of a rare fungus (*Cephalosporium acremonium* Corda) in the blood in tonsillogenic sepsis.]—*Arch. Kinderheilk.*, cxvi, 3, pp. 172–179, 6 figs., 1939.

Clinical details are given of a case of sepsis following tonsillectomy in a nine-year-old girl at the Bonn (Germany) Children's Hospital in 1938, in the etiology of which *Cephalosporium acremonium*, obtained in pure culture from the patient's blood, is assumed to have been implicated [*R.A.M.*, xvii, p. 242; xviii, p. 180].

Galloway (L. D.). **The minimum moisture regain for the development of micro-organisms on Jute.**—*J. Text. Inst., Manchr*, xxx, 8, pp. T127–T130, 1 fig., 1939.

Experiments conducted to determine the minimum moisture regain for the development of moulds [unspecified] on jute, showed that the safe limit for the moisture content of stored jute is 17 per cent., in equilibrium with about 80 per cent. relative atmospheric humidity.

In converting the safety limit into terms of moisture content the regain must be calculated on the dry weight of the fibre, exclusive of added oil. The result refers to uniform moisture distribution, but in practice, jute with an overall regain of 17 per cent. might have a local excess inducing mildew. The critical regain should, generally, be independent of temperature, though below 15° C. mould growth is appreciably retarded, and the safe regain may be a very little higher. In the case of jute stored in a closed space, the presence of a musty odour is quite a delicate test for the presence of mildew. Jute contains a large and variable number of bacterial spores, but bacterial growth only occurs at high regains, i.e., exceeding 20 per cent.

Jahnel (H.). **Grauschimmel und Wurzelbräune an Flachs.** [Grey-mould and root browning of Flax.]—*Kranke Pflanze*, xvi, 7–8, pp. 132–134, 1 fig., 1939.

In tests at Dresden, Germany, to determine the effects of varying soil reactions on root development in flax, the fibre variety Daros II was so greatly weakened by excessive acidity (P_H 4·3) that it sustained severe damage from infection by *Botrytis cinerea* [*R.A.M.*, xvi, p. 612; xviii, p. 315], which reduced the plants to a third of their normal height and caused many gaps in the stand. In another series of experiments *Thielavia* [*Thielaviopsis*] *basicola* [ibid., xvi, p. 611] produced 10 to 15 and 3 per cent. infection, respectively, on Konkurrent and Daros II. The fungus, first recorded on flax in Germany by Peters in 1921 (*Ber. biol. Anst.* (*Reichsanst.*), *1920*, pp. 63–74), is thought to be commonly overlooked through confusion of the symptoms caused by it with those of other pathogens, including *Fusarium*. The brownish-black resting conidia are believed to persist for considerable periods in the soil, and care should be taken to eradicate the alternate weed hosts of the fungus, *Senecio vulgaris* and *Chenopodium album*, from the crop preceding flax in the rotation.

Bijl (J. P.) & Van Slogteren (E.). **Serologische Untersuchung bei Narzissen, welche an einer Viruskrankheit leiden.** [The serological investigation of Narcissi suffering from a virus disease.]—*Zbl. Bakt.*, Abt. 1 (Orig.), cxliv, 1–5, pp. 109–110, 1939.

The serological reactions of rabbits to intravenous juice injections provided a means of differentiating virus-diseased (grey-striped) Sir Watkin [daffodils] (*Narcissus*) [*pseudonarcissus*: *R.A.M.*, xviii, p. 680] from healthy ones in experiments at Utrecht, Holland. Similar results were obtained with grey-striped Croesus, Waveren's Giant, and King Alfred, whereas the juices of a silver-mottled King Alfred, a grey-striped Minister Talma, and a mosaic Sion elicited a negative response, possibly denoting the agency of another virus in the etiology of these disorders.

McWhorter (F. P.). **The white streak or white stripe disease of Narcissus.**—Abs. in *Phytopathology*, xxix, 9, p. 826, 1939.

The mid-season symptoms of a transmissible *Narcissus* disease, presumably of virus origin, in the United States include prominent white and purple, longitudinal streaks on the foliage. High temperatures

tend to mask the purple and intensify the white markings. The disturbance was shown by histological examination to be quite different from yellow streak or mosaic [see preceding abstract], the white streaks being dead areas of sunken epidermal or chlorenchyma cells, while the yellow or mosaic stripes are raised overgrowths of living cells.

Plant diseases. Notes contributed by the Biological Branch.—*Agric. Gaz. N.S.W.*, l, 8, pp. 439–443, 5 figs., 1939.

No injurious effect resulted to gladiolus corms with sprouts ½ to 2 in. long following treatment against scab (*Bacterium marginatum*) [*R.A.M.*, xviii, p. 113] by dipping for 15 hours, 10 minutes, and 5 minutes, respectively, in mercuric chloride (1 oz. to 6¼ galls. water), acidulated mercuric chloride (the same, with ½ pint commercial hydrochloric acid added), and mercurous chloride (1 oz. to 1½ pints water), the corms being dried and planted on the same day in the case of the first treatment, and six days after in that of the others. Growers in New South Wales may safely employ any of these methods (the standard time for the mercuric chloride dip being eight hours) in cases where treatment has been unavoidably delayed until sprouting has begun.

Severin (H. H. P.) & Oliver (S. J.). **Delphinium Aster yellows.**—Abs. in *Phytopathology*, xxix, 9, p. 826, 1939.

Adults of the two species of leafhopper chiefly concerned in the dissemination of the California aster yellows virus to garden varieties of the perennial *Delphinium*, viz., *Thamnotettix montanus* and *T. geminatus*, were collected on naturally infected *Delphinium* and transferred to healthy ones, 84·6 of which contracted the disease from the former insect and 92·3 from the latter. The recovery and transfer of the virus from naturally infected *Delphinium* to healthy celery [*R.A.M.*, xiv, pp. 171, 313] by previously non-infective *T. montanus* and *T. geminatus* amounted to 20·8 and 4·2 per cent., respectively. In inoculation tests on healthy *Delphinium* with the two leafhoppers, seedling and second-year plants before the spikes developed acquired the virus to the extent of 100 per cent., and to that of 90 per cent. after this stage. The average incubation periods of the virus in seedlings and in second-year plants before and after spike development were 19·5, 43·5, and 45 days, respectively. In the course of these experiments the virus was recovered and transmitted from 10·9 per cent. of the infected *Delphinium* plants to healthy aster [*Callistephus chinensis*: ibid., xvii, p. 126] or celery.

Thirumalachar (M. J.). **Rust on Jasminum grandiflorum.**—*Phytopathology*, xxix, 9, pp. 783–792, 3 figs., 1939.

The autoecious rust, *Uromyces hobsoni* Vize (*J. Indian bot. Soc.*, x, pp. 195–204, 1931), originally referred by Barclay (1891) to *U. cunninghamianus*, is reported to occur on *Jasminum grandiflorum*, *J. arborescens*, and *J. officinalis* in India, and on an unidentified *J.* sp. in Somaliland. It forms on the leaves, stems, flowers, and rarely on the fruits orange, later brownish-black, swollen, pustulate cushions during the monsoon rains of July to August and persists until the following March. The affected flower buds swell, and large, oval cankers develop on the green stems and twigs. The aecidia, pycnidia, and teleutosori are produced

side by side on the hypertrophied organs, uredosori being absent. The aecidia and teleutosori were frequently observed to arise within the pycnidial cup. On germination the aecidiospores give rise to a bicellular germ-tube tapering off into one or two whip-like structures of the nature of appressoria. The teleutospores germinate without rest, forming three to four binucleate basidiospores, secondary and tertiary sporidial production also being observed. A revised description of the rust is appended. Inoculation experiments on *J. grandiflorum* resulted in the production of secondary aecidia.

NOBLE (MARY). **Notes on Pullularia pullulans in Ryegrass seed and seed-testing methods as affecting detection of certain seed-borne diseases.**—*Ann. appl. Biol.*, xxvi, 3, pp. 630–633, 1939.

Samples of seed of *Lolium perenne* and *L. italicum* from Ireland, Ayrshire, and Aberdeenshire showed the presence of *Pullularia* [*R.A.M.*, xviii, pp. 186, 601]. When infected seeds were placed in a drop of water, hyaline, oblong spores measuring roughly 12 by 2μ floated off in large numbers, but all attempts to germinate them failed. Cultures from mycelium within the seed produced masses of pink or buff-coloured spores which proceeded to bud freely. The hyphae were at first hyaline, but became opaque and brown, and had thickened walls; dark brown chlamydospores were formed more slowly. All these features agree well with Bennett's description of *Dematium* [*Pullularia*] *pullulans* [ibid., viii, p. 67], and it would appear fairly certain that the organism observed is *P. pullulans*, though whether it is responsible for the death of rye grass seed in Great Britain has not yet been determined.

In tests of the germinative capacity of infected seeds, 50 opaque and 50 translucent seeds from the same sample produced, respectively, 2 and 40 seedlings. Of the opaque seeds which failed to grow, 45 were heavily and three slightly infected, while one of the two that grew was slightly infected. Of the translucent seeds which grew, 35 were uninfected, while of those failing to germinate five were infected. In further tests only about 15 to 17 per cent. of infected (opaque) seeds grew. In one experiment, 'very dark' and 'dark' seeds gave, respectively, 8 and 40 per cent. germination, indicating that the degree of infection is shown by the degree of opacity. In another test the germination percentages of opaque and translucent seeds were 17 and 84, respectively.

LISSITZINA (Mme M. I.). К селекции Клевера на устойчивость к клеверному раку. [On the selection of Clover resistant to rot.]—*Селекция и семеноводство* [*Selection & Seed Growing*], *1939*, 5, pp. 25–26, 1939.

In field inoculation tests, extending over three years, of clover varieties for resistance to rot [*Sclerotinia trifoliorum*: *R.A.M.*, xviii, p. 684] at the Timiryazeff Academy of Agriculture, U.S.S.R., the highest degree of resistance was exhibited by the variety Yaroslavsky and its hybrid Konishtshevsky, which showed 34·8 and 41 per cent. of rotted plants, respectively, compared with infection percentages varying from 51·4 to 81·1 in seven susceptible varieties.

Thomas (H. E.) & Lawyer (L. O.). **The use of carbon disulphide in the control of Armillaria root rot.**—Abs. in *Phytopathology*, xxix, 9, pp. 827–828, 1939.

A low soil moisture content was found to be the most important single factor in the eradication of *Armillaria mellea* from orchards in three years' experiments to determine the utility of carbon disulphide for this purpose. The fungus may be destroyed to a depth of 60 in. under a wide range of conditions by the application of 45 c.c. of the compound 8 to 9 in. deep at distances of 18 in. apart, while with low soil moisture and a surface blanket of moistened earth 3 to 6 in. in depth it was completely eliminated down to 70 or 80 in. A period of from 30 to 60 days, however, is necessary for the total extermination of the fungus from all the roots. The results indicate that the eradication of the fungus from orchard soils may be possible under ideal conditions.

Gillespy (T. G.). **Studies on the mould Byssochlamys fulva. II.** *Rep. Fruit Veg. Pres. Sta., Campden, 1938*, pp. 68–78, 1939.

In further studies on *Byssochlamys fulva*, an agent of spoilage in canned and bottled fruit in England [*R.A.M.*, xviii, p. 191], the author determined the resistance to heat of the ascospores of the fungus by a method which is described in detail. Untreated ascospores of *B. fulva* were found to germinate very slowly and irregularly, the percentage after three days at 37° C. probably not exceeding 20 per cent. The average survival percentages after ten minutes' heating at 75° were 38 and 100 in distilled water and on potato sucrose agar, respectively, the corresponding figures for 30 minutes at 80° being 21 and 50, respectively. The ascospores resisted heat best at P_H 5, and the protective effect of sucrose in solutions is shown by the survival of nearly 10 per cent. after twelve minutes' heating in fruit syrups at 90°. The ascospores were totally destroyed by intermittent heating, viz., two periods of ten minutes each at 77°, separated by 30 minutes at 46°, whereas 38 per cent. withstood continuous exposure to 77° for 20 minutes.

Rose (D. H.), Bratley (C. O.), & Pentzer (W. T.). **Market diseases of fruits and vegetables: Grapes and other small fruits.**—*Misc. Publ. U.S. Dep. Agric.* 340, 26 pp., 10 (1 col.) pl., 1939.

This is a comprehensive, well-illustrated account of the market diseases of grapes and other small fruits in the United States, embodying much useful information already noticed in part from other sources. Blackberries, dewberries, and currants are subject to two rots which also affect grapes, viz., blue mould (*Penicillium* sp.) and grey mould (*Botrytis*) [*cinerea*: *R.A.M.*, xviii, p. 804]. In connexion with the mode of infection of grapes by the latter organism, it is mentioned that the spores frequently enter through sites where juice escapes when the berries are broken under pressure in tightly crowded bunches. Under cool, damp conditions in California the fungus may cause decay of the flowers, pedicels, and young berries. The form of grey mould known as 'slip skin' is a shallow epidermal infection prevalent on Late Emperors in the vineyard and in storage following autumn rains. The control of *B. cinerea* in transit depends on careful handling, refrigeration at 40° to 45° F., and prompt movement of all consignments from field

to market. For keeping varieties the storage temperature may well be 1° to 2° below the standard of 32°, their freezing point averaging about 25°. Sulphur dioxide fumigation [ibid., xiv, p. 491] is also advisable, but may cause injury [ibid., xviii, p. 467] at unduly high concentrations or if applied for protracted periods, the Castiza (Red Malaga) and Emperor varieties being more susceptible than Ribier and Alicante Bouschet. The damage may assume two different forms, a bleaching of the skin of the fruit or a dulling of the colour without bleaching. The skin and underlying flesh of the stem-end may dry out and collapse, forming small depressions simulating incipient decay. A period of up to 24 hours may elapse before the symptoms of fumigation injury become apparent.

Other grape diseases include anthracnose (*Gloeosporium ampelophagum*) [*Elsinoe ampelina*: ibid., xviii, p. 502]; black measles [ibid., v, pp. 282, 467], most prevalent on Malaga, Emperor, Alexandria (Muscat), Burger, Carignane, and Alicante Bouschet; black mould (*Aspergillus niger*) [ibid., xv, p. 701], causing losses of up to 20 per cent. in California on varieties forming tight bunches and controllable by the measures recommended against *B. cinerea*; black rot (*Guignardia bidwellii*) [ibid., xviii, p. 478], occurring throughout the United States, except in California; cracking of the blossom-end or side, especially in the Flame Tokay, Ribier, and Castiza varieties, which gives ingress to various pathogens; downy mildew (*Plasmopara viticola*); green mould (*Cladosporium*, *Alternaria*, and *Hormodendrum* spp.), developing as a firm, black rot, occasionally covered with a sparse, greyish-green growth, on Emperor and other storage grapes after three or four months' keeping; internal browning of Malagas in California, a condition analogous to that of the Ohanez variety (commonly known as Almeria), consisting of faint purple or grey, slightly sunken superficial lesions and underlying brown areas in the flesh; powdery mildew (*Uncinula necator*), occurring in the market almost exclusively on Californian grapes of the Flame Tokay, Carignane, Alexandria, Olivette de Vendemain, and Petite Syrah varieties, Alicante and Petit Bouschet and Mataro being resistant; *Rhizopus* rot (*R. nigricans*); ring or fingerprint mildew of Malaga and Alexandria, the cause of which is unknown; shot berry of Sultanina, Malaga, Muscat, and Emperor, which produce small, poorly developed fruits among those of normal size, probably as a result of imperfect pollination; water berry [ibid., ii, p. 438], characterized by softness, wateriness, and an abnormally low sugar content of the Malaga, Flame Tokay, Sultanina, and Emperor varieties; and a variant of the same condition, known as red berry, affecting Zinfandel, Cornichon, Mission, and other black varieties and inducing the development of a dull red colour.

Fungal rots of cranberries [including *Glomerella cingulata* var. *vaccinii*, *Sporonema oxycocci*, and *Diaporthe vaccinii*: ibid., xv, p. 817] are estimated to cause a loss of 25 per cent. of the crop between the grower and the consumer.

Gooseberries suffer heavy damage from powdery mildew (*Sphaerotheca mors-uvae*) in all parts of the United States.

A species of *Cladosporium* is responsible for an olive or olive-green mould of raspberries, controllable by the precautions recommended for

grape rots, which are also applicable to *B. cinerea* on strawberries. The latter fruit is also widely attacked by *Phytophthora cactorum*, the agent of leather rot [ibid., xi, p. 559; xvi, p. 584, *et passim*], for the control of which shipments should be pre-cooled to between 35° and 40° and kept below 40° in transit; a species of *Rhizoctonia* [ibid., xvi, p. 822] in central Florida, North Carolina, Tennessee, and Arkansas; *Rhizopus nigricans* [ibid., xvi, p. 264; xviii, p. 191], the critical temperature for the development of which in transit or on the market is 50°, 2° to 3° above permitting infection, while at the corresponding intervals below the product is fairly safe; a *Sclerotinia*, probably *S. libertiana* [*S. sclerotiorum*: ibid., xiv, p. 776]; and *Pezizella lythri* [ibid., xi, p. 252], causing tan-brown rot in Cuba, Louisiana, Florida, Arkansas, Tennessee, Virginia, Maryland, Wisconsin, and Alaska.

OSTERWALDER (A.). **Versuche zur Bekämpfung des Schorfes und der Schrotschusskrankheit im Jahre 1938.** [Experiments in the control of scab and shot hole disease in the year 1938.]—*Schweiz. Z. Obst- u. Weinb.*, xlviii, 16, pp. 290–302, 1939.

Under the conditions prevailing in 1938 in the Wädenswil district of Switzerland, no consistent advantage in the control of apple scab [*Venturia inaequalis*] on a number of well-known varieties was derived from the inclusion in the spray schedule of a post-blossom application of 1 per cent. sulfo (equivalent to 2 per cent. lime-sulphur) [*R.A.M.*, xvi, p. 542] on 26th June in addition to others on 27th May, 26th July, and 9th September. Storage infection occurred in a severe form despite special protective applications on London Pippin and Boiken, suggesting the advisability of a reversion to the former strength of 3 per cent. lime-sulphur for the late treatment.

Excellent control of *V. inaequalis* on Boskoop and Golden Pearmain apples, of pear scab [*V. pirina*] on Hardenpont's Winter Beurré, and of shot hole [*Clasterosporium carpophilum*] on the susceptible Bing cherry [ibid., xvi, p. 388] was given by the application on 21st March of a combined dormant and blue spray, okamito+rekato (5 per cent. carbolineum+5 per cent. of a special adhesive Bordeaux mixture containing casein), manufactured by Chem. Tech. Werke, Muttenz, followed on 20th June by 1 per cent. sulfo+calcium arsenate and on 26th July by the former alone. The yield of sound apples was increased from 49·4 to 85·9 per cent. on Boskoop and from 40·6 to 82·9 per cent. on Pearmain, while the percentage of healthy pears rose from 6·4 to 85·7 per cent. as a result of the treatment, the beneficial effects of which in the case of cherry were mainly restricted to the foliage, April frosts having destroyed the bulk of the fruit.

The results of experiments in apple and pear scab control by means of pomarsol (Ob 72) [ibid., xviii, p. 603] were not altogether conclusive, while burseen XI and fungicinol+zonol were definitely unsatisfactory.

MUNSON (R. G.). **Observations on Apple canker. I. The discharge and germination of spores of Nectria galligena Bres.**—*Ann. appl. Biol.*, xxvi, 3, pp. 440–456, 1 pl., 1 fig., 3 graphs, 1939.

After stating that the macroconidial measurements and other characters [details of which are given] of three strains of the fungus causing

apple canker at Long Ashton showed it to be identical with *Nectria galligena*, the author gives an account of field and laboratory studies from October, 1936, to October, 1937, which demonstrated that ascospore discharge occurs at all seasons in rainy weather, reaching an optimum in February, falling to a minimum in September, and rising steeply again in October and November. Discharge ceases when the perithecia are no longer saturated, but is not retarded by cold until the temperature falls below 5° C.

Ascospore germination occurred under experimental conditions at temperatures ranging from 2° to 30°, with an optimum at 20°, in many cases reaching over 95 per cent. At 25°, germination began in two to three hours, and was complete in six to eight hours. At lower temperatures it occurred more slowly, though even at 2° it was not inhibited. At 15°, germ-tubes up to 300μ long were present after 24 hours. In culture, the vegetative mycelium grew slowly at 2°.

The potential infective ability of cankered wood in relation to adjacent shoots and trees in the vicinity was clearly demonstrated by the large numbers of ascospores found on vaselined slides placed close to the cankers. The prompt removal of such sources of infection is therefore highly important in control.

MARSH (R. W.). **Observations on Apple canker. II. Experiments on the incidence and control of shoot infection.**—*Ann. appl. Biol.*, xxvi, 3, pp. 458–469, 2 figs., 1939.

In studies carried out at Long Ashton from 1936 to 1938, inoculations with *Nectria galligena* [see preceding abstract] on unwounded shoots of Cox's Orange Pippin apples demonstrated that canker infections through leaf scars may be initiated in October and April, but not in November and January. Shoots sprayed before inoculation with a Bordeaux-casein-oil mixture showed much less infection than unsprayed shoots. Similar inoculations on pruning cuts during November to April showed that freshly made cuts on apple shoots are liable to become infected throughout the dormant season. Pruning cuts made in autumn and winter acquired natural immunity within two months, whereas wounds made in March, 1938, were relatively susceptible in the following May. The most promising wound protectant tested was a mixture of monohydrated copper sulphate, hydrated lime, and linseed oil in the proportion of 5 gm., 10 gm., and 9 ml., which in a limited number of field tests completely prevented infection from inoculum applied to the treated surface.

The critical periods for leaf scar infection being in the spring and autumn, it is suggested, on the basis of the results obtained, that the addition of Bordeaux mixture to the petroleum oil emulsion at present applied in March might prove advantageous, as well as an autumn application, to nursery stock and young trees of susceptible varieties after leaf fall, of Bordeaux mixture with an oil emulsion. Pruning should be carried out in dry, frosty weather. Late pruning is not favourable to control.

[An abridged account of the work described in this and the preceding paper appears in *Rep. agric. hort. Res. Sta. Bristol, 1938*, pp. 78–83, 1939.]

Miller (P. R.). **Pathogenicity, symptoms, and the causative fungi of three Apple rusts compared.**—*Phytopathology*, xxix, 9, pp. 801–811, 3 figs., 1939.

The available knowledge concerning the symptomatology, pathogenicity to individual varieties, geographical distribution, and morphological characters of three American apple rusts, *Gymnosporangium juniperi-virginanae*, *G. globosum*, and *G. clavipes* [*R.A.M.*, xviii, p. 533, much of which has already been noticed from other sources], is discussed and presented in tabular form. The aecidiospore dimensions of the three rusts, based on collections from Indiana, New York, Arkansas, Tennessee, and Virginia, are given as 21 to 31 by 16 to 24 (mostly 27 by 22)μ, 18 to 25 by 15 to 19 (21 by 18)μ, and 24 to 39 by 21 to 32 (31 by 25)μ, respectively; those of *G. juniperi-virginianae* and *G. globosum* are dark brown (in the mass) and finely verrucose, those of *G. clavipes* bright orange and coarsely warted. The teleutospores of *G. juniperi-virginianae* are rhombic-oval and measure 42 to 65 by 15 to 21μ, while those of the other rusts are ellipsoid, 37 to 48 by 18 to 21 and 35 to 51 by 18 to 26μ, respectively, the colour of the walls being cinnamon-brown in *G. juniperi-virginianae* and *G. globosum* and yellowish in *G. clavipes*.

The evidence regarding varietal reactions to the three rusts in different States is very conflicting, probably because earlier workers generally failed to distinguish between the species involved. In the writer's inoculation experiments the York, Grimes, Rome, and Ben Davis varieties were susceptible to *G. juniperi-virginianae* and *G. globosum* but resistant to *G. clavipes* except for one physiologic race attacking Rome; Wealthy was attacked by all three rusts; Stayman and Winesap only by *G. clavipes*; Maiden Blush only by *G. globosum*; and Jonathan by *G. globosum* and (on the leaves) *G. juniperi-virginianae*.

Miller (P. R.). **The relation of aeciospore germinability and dissemination to time of infection and control of Gymnosporangium juniperi-virginianae on Red Cedar.**—*Phytopathology*, xxix, 9, pp. 812–817, 1 graph, 1939.

The results of monthly tests from August to June, 1933 to 1937, inclusive, on aecidiospore germination in the apple rust, *Gymnosporangium juniperi-virginianae* [see preceding abstract], on potted red cedar (*Juniperus*) [*virginiana*] seedlings under controlled conditions showed that the August percentage is low (maximum of about 12 per cent. in 1933), a peak being reached some time during the late winter (80 per cent. in March, 1933, 60 per cent. in February, 1934, 50 per cent. in January, 1935, and 65 per cent. in December, 1936). The dissemination of the aecidiospores takes place chiefly from July to September. Red cedars probably pass through two distinct periods of liability to infection, the first soon after the release of the aecidiospores, when germination is scanty, and a second, some time later, possibly in early spring, following the germination of the overwintered aecidiospores. Theoretically, therefore, the application of a fungicide to junipers during the dormant period should afford protection against spring attacks, and preliminary experiments by MacLachlan and Crowell along these lines did actually give promising results [*R.A.M.*, xvi, p. 618].

Kemp (H. H.) & Beare (J. A.). **The effect of water core on the keeping quality of Apples.**—*J. Dep. Agric. S. Aust.*, xliii, 1, pp. 22–28, 2 figs., 1 diag., 1 graph, 1939.

Two experiments were conducted at Adelaide to determine the effect of late water-core on the keeping quality of Rokewood apples [*R.A.M.*, xviii, p. 687] destined for export overseas, the first with unsorted fruit and the second with apples graded for the disease over a strong white light. The trouble disappeared to a considerable extent in storage, declining in the first test from 43·8 and 63·7 per cent. for apples graded 210 and 158 to the bushel, respectively, to 2·6 and 8·5 per cent., respectively, after six weeks' storage at 32° F. and three at 55° to 65°, the corresponding figures for those stored in the shed for six weeks and for three at 55° to 65° being 0·3 and 2·6, and at 40° for six weeks and three at 55° to 65°, 1·5 and 10·5. In the second test, the incidence of water-core declined during 15 weeks' storage at 32° from 25 to 4 per cent., while at 40° only isolated fruits were found to be diseased after four weeks and none after eight. The development of internal breakdown [ibid., xviii, p. 187], apparently following water-core (9·2 and 12·8 per cent., respectively, in the two grades in the first test), was, however, a disturbing feature of the results and it is considered inadvisable to use apples affected by late water-core for refrigerated storage or export.

Pohl (M.). **Die Schädigungen in Pflaumenanbau durch die Monilia.** [Damage to Plum cultivation by *Monilia*.]—*Obst- u. Gemüseb.*, lxxxv, 8, pp. 95–97, 1939.

The severe damage caused in German plum orchards, especially in districts with a heavy rainfall, by *Monilia* [*Sclerotinia laxa* and *S. fructigena*: *R.A.M.*, xviii, p. 508] cannot be effectively combated by chemical treatment, and attempts should therefore be made to reduce the incidence of the disease by preventive measures. Among resistant varieties are the blue house plum, Czar, Victoria, Kirke's, Prince of Wales, and Althans greengage. Organic manure should be very sparingly used, stone fruits responding more favourably to lime, phosphoric acid, potash, and minerals in general. *S. laxa* flourishes on trees in protected situations, where drastic thinning-out of the crowns and pruning of the long, bare lateral branches is indicated. Another measure contributing to control consists in the removal of a large proportion of the superabundant fruits. Hornets and wasps are active in the spread of infection and should be trapped.

Askew (H. O.) & Thomson (R. H. K.). **Boron status of New Zealand Apples.**—*N.Z. J. Sci. Tech.*, A, xxi, 2, pp. 128–129, 1939.

All the apple samples from the Auckland, Hawke's Bay, Marlborough, and Canterbury districts of New Zealand revealed a satisfactory boron status on analysis (15 to 23 p.p.m.), whereas all but two of those from Central Otago, though free from internal cork [*R.A.M.*, xviii, pp. 117, 725], were somewhat low in boron (9 to 19, mostly 12 to 15 p.p.m.). Even these figures, however, are higher than those reported for fruit suffering from the disorder in question in Central Otago and Nelson.

Askew (H. O.) & Lloyd Williams (W. R.). **Brown-spotting of Apricots, a boron-deficiency disease.**—*N.Z. J. Sci. Tech.*, A, xxi, 2, pp. 103–106, 1 fig., 1939.

Apricots on light-textured schist soils on the banks of the Clutha River, New Zealand, are liable to develop a brown-spotting of the flesh, especially near the stem-end, accompanied by a dry, spongy condition surrounding the stone. In experiments in 1938 on the Newcastle variety good control was obtained by the use of hydrated borax, either as a 0·1 per cent. spray, applied on 20th October and 10th November (11½ gals. per 12 trees on the first date and 10½ on the second), or as a top-dressing at the rate of ½ lb. per tree. The marked increase in the boron content of the leaves and fruit (32 and 34·5 p.p.m., respectively, in the sprayed, and 40·5 and 46·5 p.p.m., respectively, in the top-dressed series, as compared with 12·5 and 5·7, respectively, in the untreated controls) was found to be positively correlated with freedom from brown-spotting of the flesh. McLarty and Wilcox have reported (*Country Life in B.C.*, xx, December, p. 7, 1936) similar beneficial results from the application of boron in the control of drought spot of apricots in British Columbia.

[An account of these experiments is also given in *N.Z. J. Agric.*, lix, 3, pp. 229–230, 1 fig., 1939.]

Keitt (G. W.) & Clayton (C. N.). **A destructive bud-transmissible disease of sour Cherry in Wisconsin.**—*Phytopathology*, xxix, 9, pp. 821–822, 1939.

A prevalent disorder of sour cherries (*Prunus cerasus*) in Wisconsin, known as 'yellow leaf', 'physiological yellow leaf', or 'border tree', is characterized by somewhat large, sometimes chlorotic leaves, which are shed in late June or early July, a much reduced spur system, and a very sparse crop. The condition was transmitted from diseased to healthy Montmorency trees in budding experiments in 1938–9, typical foliar symptoms developing on shoots from sound buds placed on diseased trees, as well as on shoots from diseased buds inserted on healthy trees. The disease is tentatively attributed to a virus.

Gonçalves (R. D.). **A 'entomosporiose' e o desaparecimento da cultura do Marmeleiro.** ['Entomosporiosis' and the disappearance of the Quince from cultivation.]—*Biologico*, v, 8, pp. 153–157, 1 pl., 1939.

A popular account is given of the symptoms caused by *Entomosporium maculatum*, the conidial form of *Fabraea maculata* [*R.A.M.*, xviii, p. 532], on the leaves and fruits of quinces in São Paulo and other parts of Brazil, where the disease is stated to be the primary factor in the gradual disappearance of the crop from cultivation. Apart from the semi-resistant Japanese quince, grown chiefly as an ornamental, all varieties seem to be more or less susceptible to the fungus. Good control has been obtained in experimental plantings by a dormant spray of lime-sulphur (1 in 8), followed by three spring treatments with 1 or 2 per cent. Bordeaux mixture, the first at the onset of growth, the second at petal-fall, and the third two to three weeks later, similar intervals being allowed to elapse between any further applications

necessitated by adverse weather conditions or the severity of the disease.

Boresch (K.). **Weitere Untersuchung der durch Chloride hervorgerufenen Blattrandkrankheit der Johannisbeere.** [A further investigation of the Currant leaf margin disease caused by chlorides.] —*Bodenk. u. PflErnähr.*, N.F., xiv, 3–4, pp. 230–247, 3 figs., 1939.

A fully tabulated account is given of the writer's further experiments at the Tetschen-Liebwerd (Germany) Agricultural College to determine the nature of the metabolic disturbance induced in red currants by chloride fertilizers and expressed by marginal leaf scorch [*R.A.M.*, xviii, p. 39], the results of which revealed a potash-calcium antagonism as the underlying cause of the trouble. In a pot test involving the application of increasingly heavy doses of lime and sodium chloride, red currants and *Ribes alpinum* proved sensitive to both, while black currants were unharmed. The Dutch Red variety is more susceptible to marginal leaf scorch than the cherry currant. The suspected relationship between lime and chlorine antagonism is considered to be confirmed by the outcome of these studies.

Huber (G. A.). **Transmission of Black Raspberry mosaic by the cane-feeding aphid, Amphorophora rubicumberlandi.**—Abs. in *Phytopathology*, xxix, 9, p. 825, 1939.

A cane-feeding aphid, *Amphorophora rubicumberlandi*, recently detected both on wild (*Rubus leucodermis*) and cultivated (Cumberland variety) black raspberries in the Puget Sound area of western Washington, transmitted mosaic [*R.A.M.*, xviii, pp. 236, 325, 442] from the former to the latter host in 30 per cent. of the inoculated plants, and from diseased to healthy Cumberlands in 50 per cent.

Zeller (S. M.). **Stamen blight of Blackberry caused by Hapalosphaeria deformans.**—Abs. in *Phytopathology*, xxix, 9, p. 829, 1939.

Hapalosphaeria deformans [*R.A.M.*, xv, p. 817] probably enters the winter buds of blackberry during March between the leaf-like scales and infects the anthers superficially within the calyx, inducing complete emasculation. Long before the opening of the flower buds a fungal pseudoparenchyma entirely surrounds the pollen locule and parasitizes the grains. The pycnidia produced from the surface of the pseudoparenchyma become erumpent and emit coils of spores from the anther surfaces. Emasculated flowers may produce deformed berries through bee pollination. In addition to Boysenberry and youngberry [a hybrid dewberry], *Rubus laciniatus* and *R. macropetalus* have been found infected in Oregon.

Bunchy-top control. Upper Richmond area.—*Banana Bull., Sydney*, i, 39, p. 15, 1939.

H. W. Eastwood states that, although the prohibition against planting bananas in the Upper Richmond area of New South Wales has now been lifted, a permit for the movement or planting of any suckers must be obtained from the local inspector of the Department of Agriculture. The district is now in a very satisfactory position as

regards bunchy top [*R.A.M.*, xvii, p. 760], which it is hoped to maintain, with the co-operation of growers, without resorting to the reimposition of quarantine regulations.

McLachlan (T.) & Floren (J.). **Some aspects of mould growth.**—*J. Oil Col. Chem. Ass.*, xxii, 229, pp. 180–188, 1 pl., 1939.

In experiments made to investigate the growth of moulds on building materials coated with water paints and to find a suitable antiseptic to add to such paints [cf. *R.A.M.*, xviii, p. 333] plaster blocks were prepared, sterilized, treated with malt extract, inoculated with moulds [unspecified] from mouldy water paint, incubated, and coated with water paints containing antiseptics. The evidence indicated that mould growth on paint may be retarded if the under surface to which the paint is to be applied is dry, or is treated with a strong and not readily soluble fungicide, or if fungicides are added to the paint. Mould resistance in paints should be studied primarily to secure moisture-resistant, plastic films not providing food for mould growth.

Doherty (E. E.). **Pink discoloration of white chrome leather by micro-organisms.**—*J. Leath. Chem. Ass.*, xxxiv, 8, pp. 464–467, 1939.

A red yeast, identified on the basis of its cultural and biochemical characters as *Torula mucilaginosa* (*T.* [*Rhodotorula*] *glutinis*) [*R.A.M.*, xviii, p. 774], was isolated at the Cincinnati Institute of Scientific Research from pink spots, 0·2 to 2 cm. in diameter, on white chrome leather. Among other fungi isolated from one lot of white finishing materials were *Neurospora sitophila* [ibid., xvii, p. 558] and a *Fusarium*, both of which produced a salmon-red coloration on artificial media. The addition of the sodium salt of pentachlor phenol to the pickled stock at the rate of 9 lb. per 5,000 lb. gave satisfactory results in tannery practice.

Leischner-Siska (Elfriede). **Zur Soziologie und Ökologie der höheren Pilze. Untersuchung der Pilzvegetation in der Umgebung von Salzburg während des Maximalaspektes 1937.** [On the sociology and ecology of the higher fungi. Investigation of the fungal flora in the environs of Salzburg during the period of maximum occurrence in 1937.]—*Beih. bot. Zbl.*, lix, 2–3, pp. 359–429, 1 graph, 1939.

In this paper on the ecology and the sociologic associations of higher fungi tabulated data are given on 229 species found during 1937 in 22 beech and five conifer stations in the vicinity of Salzburg [Ostmark, Germany].

Porter (R. H.). **Detection and classification of seed-borne organisms, their effect on germination and their control by seed disinfection in laboratory and field.**—*Proc. Ass. Off. Seed Anal. N. Amer., 1938*, pp. 195–213, 1939. [Mimeographed.]

In this paper the author briefly describes the results obtained at the Iowa State College Seed Laboratory with certain phytopathological techniques employed in laboratory practice to determine the pathological condition of seeds. In this connexion he discusses the various

methods in general use for classifying organisms and disease-producing entities carried by seeds and vegetative reproductive organs on a systematic basis, relation to the host (systemic or non-systemic), mode of dissemination, relation to development of disease, parasitism, and effect on seed viability. The second part of the paper discusses the detection, by symptoms, of organisms and other disease-producing entities on germinating and non-germinating seeds. The methods used at Iowa for this purpose are briefly outlined. They consist in washing the seeds in sterile water, with or without centrifuging, followed by examination of the water for the presence of spores, examination of fruiting bodies on the surface of seeds and glumes of grass fruits, macroscopic examination of seed lots for sclerotia and masses of fungi, plating seeds in agar, germinating seeds on moist blotters, growing seedlings in soil or sand in the laboratory (a valuable method), growing plants in greenhouse pots, benches, and flats, and lastly, field tests for the appearance of diseases caused by seed-borne organisms. It is pointed out that when optimum conditions for seed germination and growth differ from those required by the pathogen, two tests may be necessary, one to determine the maximum viability of the seed, and another to detect the presence of and indicate the injury caused by the pathogen. In the third and final section of the paper the author discusses the classification of seed disinfectants on a basis of physical state and stability, depth of penetration, residual effect, and toxicity, and briefly describes different purposes for which they are used, their methods of application, and their effect on seed germination in the laboratory and the field.

[An account of the methods used for the phytopathological examination of seeds in Iowa is also given in *Chron. bot.*, v, 4–6, pp. 442–444, 1939.]

WENZL (H.). **Die Untersuchung epiphytischer Pilze nach dem Abdruckverfahren (Zelloidinhäutchen-Methode).** [The examination of epiphytic fungi by the 'film' process (celloidin membrane method).]—*Zbl. Bakt.*, Abt. 2, c, 14–17, pp. 327–342, 5 figs., 1939.

The writer has obtained very satisfactory results at the Vienna Plant Protection Institute by the use of the following technique for the examination of epiphytic fungi, especially such groups as the mildews, Mucedineae, and Dematiaeae. Solutions of celloidin (5 to 5·5 per cent.) dissolved in alcohol-ether (1:2), with the addition of 40 per cent. *Ricinus* oil for softening where indicated, gelatine (17 to 20 per cent. in water), or gum arabic (35 per cent. in water+30 per cent. glycerine) are smeared or painted on the infected surface by means of a glass rod or paint brush (preferably the former), allowed to dry for ½ to 1½ hours, and the films then peeled off. Other useful compounds tested were ethyl cellulose and oxyethylpropylcellulose. Before examination gelatine films are allowed to swell in water, gum arabic in glycerine (60 per cent.), and celloidin in alcohol (96 per cent.). For permanent mounts of the water-soluble gelatine and gum arabic films dilute glycerine (two parts to one of water) is recommended (after dipping the film in alcohol), while for those of the other preparations concentrated glycerine is more suitable.

Effect of sulphur dioxide on vegetation.—447 pp., 48 pl. (2 col.), 5 figs., 54 graphs (1 col.), 3 maps, Ottawa, National Research Council of Canada, 1939. $15.

This book consists of fifteen papers by different authors describing various aspects of investigations carried out almost continuously for over eight years in North America into the effect of sulphur dioxide on vegetation, the inquiry resulting from complaints by farmers of northern Stevens County, Washington, that fumes from the Trail smelter, in the Columbia River valley, British Columbia, were damaging their crops and forests. A considerable reduction in the quantity of sulphur dioxide given off has been effected and the concentration of the gas near the plant has been reduced from a maximum of 1·3 p.p.m. (April, 1933) to a maximum during 1937 of 0·48 p.p.m.

The evidence showed that accurate diagnosis of the distribution and intensity of sulphur dioxide symptoms on leaves of plants is difficult unless data are obtained as to the character and intensity of the sulphur dioxide visitations, the meteorological conditions, the sulphur content of the affected plants, and the reaction of indicator plants. Markings resembling those due to sulphur dioxide may be attributable to winter injury, drought, insects, fungi, or physiological troubles.

Acute symptoms of sulphur dioxide injury to crop plants are seldom present when rainfall is deficient. The most susceptible crops include lucerne, barley, rye, wheat, and oats.

Symptoms of acute injury on conifers consist in a reddish discoloration of the leaves involving the entire length of the leaf or a small area at the base, middle, or tip, subsequent shrinkage of tissue, and defoliation. Frequent repetition of such injury induces the fall of the older leaves. If the gas concentration is weaker chronic injury results, consisting in partial destruction of chlorophyll with resultant chlorosis. Transplanted conifers in irrigated plots were more susceptible to injury than similar species growing under natural conditions.

In cereals the symptoms of acute injury consist in somewhat flaccid, greyish-green areas, which rapidly dry up in the presence of sunlight, the cell contents shrinking and the leaf becoming bleached after decomposition of the chlorophyll. Chlorotic, as distinct from acute, injury in cereals causes a temporary or permanent loss of the normal green colour of the chlorophyll; in the temporary type of injury the leaves do not lose their turgor, and the affected plants may recover.

A study of the influence of concentrations of sulphur dioxide from 0·1 to 5·8 p.p.m. on the stomatal movement of lucerne leaves demonstrated that with the highest concentrations partial or total stomatal closure ensued a few minutes after application of the gas. With decreasing concentration this effect gradually disappeared.

No evidence was found that in the absence of leaf injury sulphur dioxide exerts an invisible effect detrimental to the yield and growth of crops. Experiments on lucerne showed that in the absence of visible symptoms sulphur dioxide began to exert a measurable effect on photosynthesis when the concentration was about 0·4 to 0·5 p.p.m., carbon dioxide assimilation rapidly returning to normal after removal of the gas. Short treatments in daylight with high concentrations not causing appreciable leaf injury increased subsequent night respiration.

COTTAM (C.). **The Eelgrass situation on the American Pacific coast.**—*Rhodora*, xli, 487, pp. 257–260, 1939.

The author reports there is no authentic data indicating any reduction of eelgrass (*Zostera marina*) along the Pacific coast of North America: although *Labyrinthula* [*macrocystis*] has been identified from eelgrass in Departure Bay, British Columbia [*R.A.M.*, xvii, p. 543], the beds there continue to make good growth. In September, 1938, Dr. Borgesen reported that the eelgrass along the Danish coast was recovering [ibid., xv, p. 671]. Some improvement has occurred since February, 1938, off eastern Maine, and A. D. Cotton reported in August, 1938, that he believed the situation was easier in English waters [ibid., xviii, p. 334].

STEVENS (N.). **Environmental factors and the wasting disease of Eelgrass.**—*Rhodora*, xli, 487, pp. 260–262, 1939.

With reference to Tutin's view that the disappearance of eelgrass (*Zostera marina*) from English waters [see preceding abstract], was due to deficient sunshine, the author considers that the available data from the American Atlantic coast do not support this hypothesis. As no report of the disease has been received from the Mediterranean, where the salinity of the surface waters is 37 to 39 per mille, the effect of salinity on the parasite (*Labyrinthula*) [*macrocystis*] might advantageously be studied in this locality.

HAMADA (M.). **Studien über die Mykorrhiza von Galeola septentrionalis Reichb. f. Ein neuer Fall der Mykorrhiza-Bildung durch intraradicale Rhizomorpha.** [Studies on the mycorrhiza of *Galeola septentrionalis* Reichb. f. A new case of mycorrhiza formation by intraradical rhizomorphs.]—*Jap. J. Bot.*, x, 1–2, pp. 151–211, 2 pl., 15 figs., 1 diag., 9 graphs, 1939.

The following are among the reasons adduced for the relatively immense size attained by the orchid *Galeola septentrionalis* [cf. *R.A.M.*, xi, p. 317; xviii, p. 801] in the Kyoto district of Japan, where the roots and rhizomes of the plants may occupy an area of 1 are. The fungal symbiont, identified as *Armillaria mellea* on the basis of comparative culture with known strains although the fruit bodies have not been produced, provides an abundance of raw nutrient materials, which it actively dissolves and conveys directly to the root tissues by means of subterranean and subcortical rhizomorphs. The root system of the host (up to 5 m. in length) is further possessed of an extensive digestive and storage tissue so that the metabolic processes function with extreme regularity. The outer cortex is resorbed by the rhizomorphs, some of which are also extruded from the intraradical rhizomorph complex in search of fresh food supplies.

Kusano has shown that *A. mellea* is likewise the fungal symbiont of *Gastrodia elata* (*J. Coll. Agric. Tokyo*, iv, 1911), on which, however, it does not form intraradical rhizomorphs or possess a well-developed digestive tissue, with the result that the modes of ingestion differ completely in the two hosts.

In *Galeola septentrionalis* the symbiont invades the cortex during the summer and autumn, and ingestion proceeds through the winter and

until the following summer, *A. mellea* gaining the upper hand at a time when its optimum soil temperature of 25° C. prevails and the host being active under the more congenial conditions of the colder months. The reactions of the host to its invader include lignification and 'Röhrentüpfel' formation of the outer cortical and epidermal cells as well as nuclear deformation of the cortical cells. As with many other orchids, the process of ingestion of the fungal coils is preceded by a turning-point at which the hydrogen-ion concentration of the hyphal clumps reaches a maximum of P_H 6·2. Of the reserve food substances, starch and oil increase in the root system during the active, and albumin during the inactive, period.

RAYNER (M. C[HEVELEY]). **The mycorrhizal habit in relation to forestry. III. Organic composts and the growth of young trees.**—*Forestry*, xiii, 1, pp. 19–35, 4 pl., 3 graphs, 1939.

In further studies on growth responses of young conifers to the addition of certain organic composts to soil [*R.A.M.*, xv, 737], the method of comparative pot cultures with transported soil was used. In two series one of two kinds of compost was added to the soil at sowing time and in two others salts were added estimated to supply equivalent values of nitrogen, potash, phosphoric acid, and lime to those in the composts. One set of each duplicate series had the drainage water returned to the pots, whilst in the other this was not done.

At the end of the first year's growth seedlings of Scots pine [*Pinus sylvestris*] grown in soil receiving compost exhibited better growth than those receiving equivalent soluble salts, and this difference became still more marked during the second season. The fact that the addition of soluble salts evoked surprisingly little response in pine seedlings as compared with responses to composts confirms the author's previous conclusions that the use of organic composts produces qualitative changes in the humus constituents and that these, rather than the increase in the supply of available nutrients, are the fundamental cause of restored fertility. On the whole, plants with drainage not returned were slightly better (possibly excepting those receiving composts) than those with drainage returned, but the difference was very small. From the dry weights, however, it became evident that when the return of drainage water increased the dry weight this increase affected mainly the roots, whereas when the return of drainage water decreased the dry weight this decrease affected mainly the shoot system. Return of the drainage water was unfavourable in all cases except where composts were added.

The results of these experiments confirm the conclusion already reached that deleterious substances exist in the soil solution and show further that the addition of mineral salts is practically without effect on the production of such substances, whereas that of composts stops their formation. The strikingly beneficial effect of the composts on the growth of conifers is believed to be closely bound up with the mycorrhizal habit and its reaction on nutrition, and it is pointed out in support of this view that in the above-described experiments all plants showing maximum size, health, and vigour displayed a corresponding development of mycorrhiza.

Romell (L. G.). **Barrskogens marksvampar och deras roll i skogens liv.** [The soil fungi of the conifer forest and their rôle in its life.]—*Svenska SkogvFören. Tidskr.*, iii, 37, pp. 349–375, 1 fig., 1939. [English summary.]

Some of the information contained in this critical review of the available knowledge of the mycoflora of conifer forests, with special reference to the mycorrhizal problem in Sweden, has already been noticed from other sources [*R.A.M.*, xiv, p. 602; xviii, p. 541], but the following additional points are of interest. P. Larsen (*Friesia*, i, pp. 157–193, 1934) calculated in west Jutland, Denmark, that an annual crop of the fruiting bodies of only one species of large mycorrhizal Hymenomycetes amounted to some 180 kg. dry weight per hect. and contained 5 kg. nitrogen per hect.

Proof of the hypothesis that facultative mycorrhiza exist in addition to the obligate species is considered to be supplied by the appearance of *Boletus tomentosus* in experimental trenched plots containing neither tree roots nor other mycorrhiza.

Two effects of mycorrhizal formation must be distinguished—one physiological, involving the transformation of uninfected roots into more efficient organs of absorption, and the other ecological, entailing the substitution of mycorrhiza for pseudomycorrhiza, which develop in nature in the absence of mycorrhiza but are poor organs of absorption, inferior to the uninfected roots. The author does not accept Rayner's explanation of the activity of composts in promoting pine growth and mycorrhizal formation in a poor heath soil [see preceding abstract]. The simplest interpretation of her results is that the addition of compost counteracts the lack of available nutrients, which precludes both host and mycorrhizal growth in the unfertilized soil.

Thom (C.) & Steinberg (R. A.). **The chemical induction of genetic changes in fungi.**—*Proc. nat. Acad. Sci., Wash.*, xxv, 7, pp. 329–335, 1939.

By culturing stable strains of *Aspergillus niger* and *A. amstelodami* [*R.A.M.*, xiv, p. 671] in a mannitol-sodium nitrite solution [the composition of which is given] the authors were able to obtain consistent variation under nitrite stimulation. The changes in morphology observed in *A. niger* included increased vegetative mycelium, increased production of yellow to orange colour in the hyphae, reduction in the conidia-producing apparatus in the form of diminutive stalks, reduced size of heads, elimination or reduction of the primary sterigmata, great reduction in the numbers of spore-producing cells, and the production of comparatively few spores. With *A. amstelodami* the changes noted were as follows. Few perithecia were produced and were differently placed, the green conidial phase was increased, as was the vegetative mycelium, reduction beginning with the complex form of fruiting and accentuating the simpler.

The results seem to offer a clue to the origin of groups of strains capable of remaining taxonomically stable for long periods in standard culture media, but in which spore characters are almost identical. Further work may provide means of interpreting other groups and of producing variations possessing useful biochemical activity.

KATSER (ANNIE). **Besitzt Botrytis vulgaris antagonistische Eigenschaften gegenüber Phytophthora Arten und kann sie zur biologischen Bekämpfung derselben herangezogen werden?** [Is *Botrytis vulgaris* antagonistic to species of *Phytophthora* and can it be used for their biological control?]—*Boll. Staz. Pat. veg., Roma*, N.S., xix, 1, pp. 75–86, 6 figs., 1939. [Italian summary.]

In the course of the author's recent studies on fungi antagonistic to *Phytophthora* [*R.A.M.*, xviii, p. 486], *Botrytis vulgaris* [*B. cinerea*] was seen to suppress the growth of *Phytophthora* even more rapidly than *Trichoderma*. In experiments undertaken with the object of investigating this relationship *B. cinerea* was found to be strongly antagonistic to *P. citrophthora*, *P. megasperma*, *P. cambivora*, and *P. parasitica*, but filtrates from cultures of *B. cinerea* were considerably less injurious to *P. citrophthora* than the fungus itself. No evidence of antagonism was manifest in mixed inoculations with *P. parasitica* and *B. cinerea* on tomatoes and combined soil inoculations were inconclusive. It is concluded that *B. cinerea* is of no practical value for the biological control of *P. parasitica* on tomato.

VAN LUIJK (A.). **Antagonisme tusschen microorganismen.** [Antagonism between micro-organisms.]—*Vakbl. Biol.*, xx, 10, pp. 177–188, 1939.

This is a critical survey of some recent important contributions [most of which have been noticed in this *Review*] to the knowledge of mutual antagonism between fungi.

COCKERHAM (G.). **A comparison of the metabolism of mosaic diseased Potatoes with that of normal Potatoes.**—*Ann. appl. Biol.*, xxvi, 3, pp. 417–439, 8 graphs, 1939.

Studies in Scotland on the carbohydrate and nitrogen metabolism of the leaves and petioles of healthy President and Arran Victory potato plants and others of the same varieties infected with potato virus X [*R.A.M.*, xiv, p. 52; xv, p. 523] showed that while comparisons between carbohydrate variations over diurnal and seasonal periods establish a similarity in the gross metabolism of carbohydrates in normal and mosaic leaves, definite, if slight, modifications of the fundamental metabolism may arise as a result of mosaic infection. At every stage of the diurnal investigations the diseased laminae had lower starch values than the healthy ones. Slight differences in carbohydrate variations consistently indicated impediment in starch formation and hydrolysis in the affected leaves. There was also evidence of interference with the utilization of sugars in the early growth stages, when the affected leaves were actively engaged in tissue synthesis. This change in metabolism merely preceded, however, a similar change in healthy leaves, and subsequently the only differences between the diseased and healthy leaves in this respect were in the slightly reduced amounts of carbohydrate and a persistent interference with starch elaboration in the mosaic leaves.

The slight disturbances observed in diurnal carbohydrate metabolism in the mosaic leaves would appear to be due to two possible causes:

(*a*) pathological changes brought about by the virus in the mottled areas; (*b*) disturbances affecting primarily the growth activities of the diseased plant leading to a diminished demand for carbohydrates required for growth. A significantly larger nitrogen content was found in diseased leaves at all stages of growth and it is possible that the pathological symptoms and retarded growth activities, which give rise to disturbances in carbohydrate metabolism, may result directly from a disorganized nitrogen metabolism.

WALKER (J. C.) & LARSON (R. H.). **Yellow dwarf of Potato in Wisconsin.**—*J. agric. Res.*, lix, 4, pp. 259–280, 5 figs., 1 map, 1939.

In studies carried out in Wisconsin from 1933 to 1938, inclusive, on potato yellow dwarf [*R.A.M.*, xviii, p. 540] it was found that an important symptom not previously recorded is the non-emergence of plants from infected seed tubers. The top symptoms were shown to develop most rapidly and severely at high air temperatures and at 16° C. they may be completely suppressed. Low soil temperatures favour the germination of infected seed and the emergence of shoots but tend to suppress the appearance of top symptoms, whereas high soil temperatures tend to prevent emergence and enhance the expression of top symptoms. The 'poor-stand' phase of the disease in Wisconsin is associated with high soil temperatures, the majority of the crop being planted late.

The destructiveness of the disease locally has varied greatly from year to year. In a cool season the evidence of current-season spread may be entirely masked and the difficulty of maintaining healthy seed stocks in some areas is correspondingly great. Confirmatory evidence was obtained that the clover leafhopper (*Aceratagallia sanguinolenta*) [loc. cit.] is a vector of the disease and in 1937 a close correlation of seasonal spread of the virus with abundant infestation with this insect was established. No field evidence was obtained of spread by the potato leafhopper (*Empoasca fabae*) or aphids, and no correlation was found between yellow dwarf epidemics and red clover (*Trifolium pratense*) plantings, other sources of inoculum being evidently more important in central Wisconsin. During the 1937 epidemic the Russet Burbank variety tended to escape infection, though 18 other potato varieties and strains in the vicinity were heavily attacked.

DECKER (P.). **A new Potato disease in New York.**—*Plant Dis. Reptr*, xxiii, 14, pp. 226–227, 1939. [Mimeographed.]

A disease of potatoes, agreeing very closely with 'blue stem' [*R.A.M.*, xviii, p. 53] and also with 'purple top wilt' [ibid., xvii, p. 700] and believed to be a form of western aster yellows [ibid., xvi, p. 797], was observed in an early planting of Warba and Cobbler varieties on a farm near Boston, New York State, the symptoms being present on approximately 15 per cent. of the former and 2 per cent. of the latter variety. All varieties of potatoes are susceptible to the disease, the reduction in yield depending largely upon the stage of development of the potato plant at the time of infection. Reports from West Virginia state that in 1935 one field showed nearly 100 per cent. severely infected plants and yielded only 10 bush. of U.S. No. 1 tubers per acre, and that

similar cases have occurred in each succeeding year. The disease is not transmitted by the tubers but is carried over from year to year in weed hosts. The aster leafhopper [*Cicadula sexnotata*], a vector of the virus, was present on many different plants.

REDDICK (D.). **Whence came Phytophthora infestans?**—*Chron. bot.*, v, 4–6, pp. 410–412, 1939.

The author discusses the possible origin of potato blight (*Phytophthora infestans*) [*R.A.M.*, xviii, p. 544], first observed in North America in 1842, and advances the view that the original introduction of the parasite to potato fields in this region or to any region of the Old World was possibly by means of oospores from some Solanaceous plants introduced for ornamental or pharmaceutical purposes. The assumption that *P. infestans* is enphytotic in the higher Andes of South America is believed to be false, for (1) no sample of potato from this region has even been found to show resistance to the disease; (2) the fungus has not been found on herbarium specimens collected before 1850; and (3) it is only prevalent in Peru and Chile where European potatoes are grown. On the other hand, the parasite is probably enphytotic in Mexico for (1) cultivated potatoes are rare in this country; (2) the fungus occurs on wild native species; and (3) most of the species are resistant or immune. It is suggested, therefore, that more intensive studies should be undertaken on the behaviour of the parasite on Mexican Solanaceous plants rather than those of South America.

CAIRNS (H.) & MUSKETT (A. E.). **Phytophthora erythroseptica Pethybr. in relation to its environment.**—*Ann. appl. Biol.*, xxvi, 3, pp. 470–480, 2 graphs, 1939.

In studies carried out in Belfast on the potato pink rot organism *Phytophthora erythroseptica* [*R.A.M.*, xiii, p. 180; xviii, p. 135], the effect of staling on the growth rate on natural media was negligible. On some synthetic media, however, notably where potassium nitrate served as a source of nitrogen growth ceased about 1 cm. from the edge of the Petri dish. Daylight exercised no appreciable effect on the growth or reproduction of the fungus. Growth occurred over a wide range of hydrogen-ion concentrations (P_H 3·2 to 9 or 10), the optimum being P_H 6·0 to 7·0. Oospores developed freely over most of the P_H growth range, but not near the limits of acidity or alkalinity. Sporangia were not produced on the gel media used.

On oat, potato, and malt extract agars the minimum, optimum, and maximum temperatures for growth were, respectively, 5°, 25°, and 31° C. Direct infection of the tubers seldom occurred below 10° or above 30°, the optimum for infection and development of the disease being about 20° to 25°.

Referring to the form of pink rot (known to farmers as 'waterslain' or 'drowning') due to simple asphyxiation by flooding, the authors show that under aseptic conditions in the laboratory, death of the tubers, or the lowering of their resistance to a point where they readily become invaded by putrefactive organisms, occurred after submergence in water for at least 24 hours at 16° to 20°. Tuber decline in these conditions was accompanied by symptoms resembling pink rot due to parasitic causes. In so far as *P. erythroseptica* is responsible for pink

rot, excessive soil moisture is also conducive to the disease, in which case infection may readily take place by way of the 'eye'. With low soil moisture infection in contaminated soil is inhibited and with normal moisture occurs through the 'heel' of the tuber via the dead or moribund stolon. 'Eye' infections may be due to zoospores.

The results obtained show that attempts to control the disease by modifying the soil acidity are impracticable. Lime as a soil flocculant, by improving drainage, should, however, tend to limit the incidence of infection.

GREEVES (T. N.) & MUSKETT (A. E.). **Skin spot (Oospora pustulans Owen & Wakef.) of the Potato, and its control by tuber disinfection.**—*Ann. appl. Biol.*, xxvi, 3, pp. 481–496, 1 pl., 1939.

In experiments carried out in Belfast from 1933 to 1938 on the control of potato skin spot (*Oospora pustulans*) [*R.A.M.*, xviii, p. 412] by seed tuber disinfection, the best results were given by instantaneous dipping (from ½ to 1 min.) in three proprietary organo-mercury compounds (A, B, and C), especially organo-mercurial C. Steeping for 90 minutes in a 0·1 per cent. solution of mercuric chloride was also effective, but unduly tedious.

Disinfection at digging was considerably more effective than immediately before planting, and when a period of more than eight weeks was allowed to elapse between digging and disinfection the value of the treatment was substantially diminished. In one year's experiments early digging did not reduce the amount of infection which developed during subsequent storage. Disinfection at each of the five diggings gave satisfactory control.

As disinfection of seed tubers at digging has also given good results against *Actinomyces scabies* [ibid., xvi, p. 273] and *Phytophthora infestans* [ibid., xvi, p. 488], it would appear that this treatment may prove effective against a group of seed tuber diseases, many of which are transmissible to the subsequent crop.

DE BRUYN (HELENA L. G.). **Onderzoekingen over enkele Actinomyceten, welke Aardappelschurft verwekken.** [Studies on some Actinomycetes responsible for Potato scab.]—*Tijdschr. PlZiekt.*, xlv, 4, pp. 133–156, 3 pl., 1939. [English summary.]

Some of the information in this study on potato scab (*Actinomyces scabies* and other *A.* spp.) at the Wageningen (Holland) Mycological Laboratory [*R.A.M.*, xv, p. 250] has already been noticed from various sources. The different types of the disease are distinguished, and in this connexion the results of soil inoculation experiments with pure cultures of the fungi on sterilized green rye or grass are reported to have confirmed the previous conclusion of the writer and others that the deep and superficial (russet) forms of infection are due to two separate strains. Further evidence of the dissimilarity of the strains responsible for the different scab types was afforded by the varying reactions of the varieties used in the experiments. For instance, a strain causing russet of Bintje and Industrie was non-pathogenic to Eigenheimer, Jubel, Alpha, Thorbecke, and Roode Star. Again, strain 3a, the agent of a virulent deep scab on Bintje, similarly affected

Industrie, Eigenheimer, Thorbecke, and Roode Star, whereas on Jubel the lesions were very shallow and Alpha developed a type partaking both of the russet and common characteristics, predominantly the former. In other tests all russet-forming strains severely attacked Bintje while sparing Eigenheimer, which was badly injured, on the other hand, by strains of the deep type.

In respect of retention of virulence the experimental strains varied considerably. Strain 5, for example, isolated in 1933, did not begin to decline until after 1½ years in pure culture; reisolation in 1935 produced a renewal of pathogenicity, which again gradually decreased. Of a number of strains investigated in 1937–8, B_2 was the only one acquiring an increase of virulence in pure culture; two strains remained constant, while eight others underwent a decrease of pathogenicity, which was restored to varying degrees by reisolation. No restorative effect was produced by the culture of weakened strains on sterile sections of living potato or carrot, indicating that the special substances inducing virulence are present only in the actively growing potato tuber cells.

Discussing the problem of control, the author advocates increased attention to rotation, not only of unrelated crops but also of different potato varieties, the negative reaction of some of which to certain strains of the fungus, as shown above, may be equivalent to the entire omission of potatoes from the scheme. Ferric chloride was the only one of various chemicals tested to give effective control of scab; applied at rates in excess of 10 gm. per pot, however, it caused considerable injury to the plants, and its use in the field is regarded as impracticable.

Dorst (J. C.). **Schurftaantasting bij nakomelingen van verschillende Aardappelkruisingen.** [Scab infection among the progeny of various Potato crosses.]—*Tijdschr. PlZiekt.*, xlv, 4, pp. 157–161, 1 graph, 1939.

The reaction to scab (*Actinomyces scabies*) [see preceding abstract] in the breeding field of the Friesian Agricultural Society (Holland) among the progeny of four potato crosses [ibid., xviii, p. 200], viz., K131 × Groene Furore, Iris × Furore, Bravo × Alpha, and Dunbar Yeoman × Geeltje was computed arithmetically and estimated by groups in relation to the quasi-immune Alpha (1) and the very susceptible Ideaal (9). Of the K 131 × Groene Furore cross, 9 out of 19 plants fell into group 1, and 3, 5, and 2 into groups 2, 3, and 4, respectively, thus providing very satisfactory breeding material. The Iris × Furore cross also yielded a fair proportion of sound offspring, 9 out of 44 being placed in group 1, 15 in 2, 8 in 3, and 5, 4, 2, and 1, in groups 4, 5, 6, and 8, respectively. On the other hand, the resistance of the Bravo × Alpha and Dunbar Yeoman × Geeltje crosses was decidedly poor, only 1 of each falling into group 1 out of 18 and 21, respectively.

Ayers (G. W.) & Hurst (R. R.). **Verticillium wilt of Potatoes in Prince Edward Island.**—*Sci. Agric.*, xix, 12, pp. 722–735, 4 figs., 1 graph, 1939.

Since 1937 wilt disease of potatoes (*Verticillium albo-atrum*) [*R.A.M.*, xvii, p. 700] has been recognized as a problem of importance in the Prince and Queen's Counties of Prince Edward Island, Irish Cobbler

being the variety most subject to it. The seed potato inspection service has found it extremely difficult to obtain accurate field estimates of this disease, as wilt symptoms vary in the time of their appearance and severity from year to year, and even from day to day, according to climatic conditions. Generally wilt symptoms are more pronounced in extremely dry years, while under moist conditions they are not easily observed; on hot, sunny days the wilted plants will display a noticeable flagging, while on a cool, overcast day they often recover. Attacks of early or late blight [*Phytophthora infestans* and *Alternaria solani*] may, furthermore, totally mask any wilt present.

It has been observed that wilt attacks become evident after the first week in August in each year, the percentage of infection increasing as the season advances. Growth of the fungus in culture was good over a wide range of temperatures (60° to 77° F.) but the maximum and optimum were 30° to 32°, and 19° to 21° C., respectively. In most cases where major epidemics of wilt have occurred in the field, the origin of infection could be traced back to a diseased stock of the previous year. It was found that both eye- and stem-end sets of diseased tubers are liable to produce wilted plants.

The chief economic effect of wilt lies in reduced yields of marketable tubers. The results of field tests seemed to indicate that infection taking place in the field has no immediate effect on the yield, but when tubers from diseased plants were used for seed considerable reduction in yield followed. A plot with approximately 60 per cent. wilt showed 35 per cent. reduction in marketable tubers compared with that from certified seed, the total production being reduced by approximately 30 per cent. Control measures advocated at present consist in (1) the use of disease-free seed, (2) roguing of diseased plants and those immediately adjacent, and (3) the practice of a long rotation where the disease has been encountered.

MARTIN (A. L.). **Rice straw stacks as a source of infection with the black kernel disease.**—*Plant Dis. Reptr*, xxiii, 14, pp. 247–249, 1939. [Mimeographed.]

Cultures made from dust blown from rice straw stacks, used as forage for cattle in Texas, during the spring and summer of 1939 showed the presence of several species of fungi, colonies of *Curvularia lunata* being more numerous in those cases where the previous crop had been infected with black kernel disease, tentatively attributed to this fungus [*R.A.M.*, xviii, p. 545]. It would thus appear probable that *C. lunata* is capable of overwintering in the straw stacks and new infection may result from spores blown to the flowering plants in the next season. Dry weather and high winds during the flowering period may increase the amount of infection.

RYKER (T. C.). **Leaf blotch, a new disease of Rice and certain native plants in Louisiana.**—Abs. in *Phytopathology*, xxix, 8, pp. 749–750, 1939.

In July, 1936, rice plants near Crowley, Louisiana, developed a disease of the leaves and leaf sheaths characterized by large, irregular, bleached, reddish-tinted and -bordered, coalescent lesions, destroying

a large portion of the foliar tissue, and in some instances by small, scattered, circular spots. Similar symptoms were observed on a number of weeds, including *Caperonia castaneaefolia*, *Axonopus furcatus* [*Paspalum furcatum*], *Echinochloa crus-galli*, and *P.* spp., and have since been noted on rice and *Cynodon dactylon* in the south-west Prairie, on *A. compressus* [*P. compressum*] in Texas, and on *Carex frankii* near Baton Rouge, Louisiana. The sterile fungus isolated from diseased material grows with extreme rapidity, producing in and on the medium thin, greyish-brown, stromatic crusts suggestive of a species of *Ciboria* or a related genus. The symptoms have been induced on rice by introducing fragments of mycelium into the leaf and leaf sheath tissues.

Cronshey (J. F. H.) & Barclay (C.). **Replanting in areas infested by root disease. Preliminary results obtained from an experiment on low land on Sumatra's east coast.**—*Arch. Rubbercult. Ned.-Ind.*, xxiii, 3, pp. 163–172, 1939. [Dutch summary.]

In experimental plots on the Serbangan estate, east coast of Sumatra, the use of *Pueraria javanica* as a cover crop after felling for rubber [*Hevea brasiliensis*] reduced the losses from white root rot (*Fomes lignosus*) [*R.A.M.*, xviii, p. 728] from 1936 to 1938 by an average of 60 per cent., the damage in these plots being only two-fifths of that recorded in the clean-weeded series; the growth of the trees, however, was less vigorous. Stump-pulling instead of felling, entailing the eradication of the root-collars, parts of the tap-roots, and large side roots, and digging with a short-handled grub-hoe, produced little effect singly, but when applied jointly (clean-clearing) these methods reduced the root rot losses by slightly under half. The maximum benefit from the digging of plant holes, bringing the losses down by about a quarter, was experienced during the first year. Taken collectively, all the cultural practices under discussion have diminished the losses due to white root rot and similar diseases to about a seventh of their incidence in the absence of any treatment, i.e., from 55 trees per acre (18 per cent.) to 7·4 (2·5 per cent.). It is suggested that the best treatment would be to establish a cover and to weed near the trees.

Gehlsen (C. A.). **Die Rindenbräune von Hevea brasiliensis.** [Brown bast of *Hevea brasiliensis*.]—*Tropenpflanzer*, xlii, 8, pp. 323–329, 1939.

This is a summary, based on a perusal of the relevant literature, of the available knowledge concerning brown bast of *Hevea* rubber [*R.A.M.*, xvii, p. 414].

Krya [? Kiryu] (T.). **Studies on the physiological characters of Ceratostomella paradoxa.**—*Rep. Govt Sug. Exp. Sta., Tainan*, 6, pp. 21–37, 1939. [Abs. in *Facts ab. Sug.*, xxxiv, 10, p. 33, 1939.]

Potato sucrose agar proved to be the best of the media tested for the mycelial and conidial growth of *Ceratostomella paradoxa*, the agent of pineapple disease of sugar-cane [*R.A.M.*, xvi, p. 774; xviii, pp. 625, 626], which is stated to be ubiquitous in Formosa. Development took place at a temperature range of 13° to 34° C., with an optimum at 25° to 31°, and at hydrogen-ion concentrations between P_H 1·7 and

11, the optimum being 5·5 to 6·3. Growth is made on substrata containing up to 30 per cent. sucrose, but is most vigorous at 3 per cent., the addition of 0·3 to 0·5 per cent. common salt exerting a further stimulus.

LITSCHAUER (V.). **Ein Beitrag zur Kenntnis der Basidiomyceten der Umgebung des Lunzer Sees in Niederdonau.** [A contribution to the knowledge of Basidiomycetes in the environs of the Lake of Lunz in the Lower Danube Valley.]—*Öst. bot. Z.*, lxxxviii, 2, pp. 104–147, 6 figs., 1939.

This is an annotated list of 269 fungi, including a number of Polyporaceae, collected in 1930 in the environs of the Lake of Lunz, Lower Danube, Austria.

HIRATSUKA (N.). **Miscellaneous notes on the East Asiatic Uredinales with special reference to the Japanese species (V).**—*Jap. J. Bot.*, xv, 7, pp. 433–439, 1939.

This further instalment of the author's critically annotated list of Uredinales from eastern Asia (chiefly Japan) [*R.A.M.*, xviii, p. 204] includes *Uromyces ervi* (syn. *U. fabae*) [ibid., xvi, p. 207; xviii, pp. 204, 553, 567] on vetch (*Vicia sativa*), recorded for the first time from China, and *Nyssopsora cedrelae* on *Cedrela sinensis* in Japan.

SOONG (T. F.). **Beitrag zur Cytologie der Uredinee Ochropsora sorbi Diet.** [A contribution to the cytology of the Uredine *Ochropsora sorbi* Diet.]—*Flora, Jena*, N.F., xxxiii, 4, pp. 345–364, 15 figs., 1939.

The results of an intensive cytological study at Marburg University, Germany, of *Ochropsora sorbi* on *Pyrus aucuparia* and *Anemone nemorosa* are described in detail.

BALDACCI (E.). **Introduzione allo studio degli Attinomiceti.** [An introduction to the study of the Actinomycetes.]—*Mycopathologia*, ii, 2, pp. 84–106, 3 pl., 1939. [English summary.]

In this paper the author sums up and critically discusses the present state of knowledge concerning the Actinomycetes, with special reference to the systematic position of these fungi [*R.A.M.*, xviii, p. 626].

SIMURA (T.). **Studies on the resistance to brown blight in Tea plants.**—*Jap. J. Genet.*, xiv, pp. 243–247, 1939. [Japanese. Abs. in *Plant Breed. Abstr.*, ix, 4, p. 455, 1939.]

Analyses of a number of tea varieties with strong, moderate, or weak resistance to brown blight (*Guignardia camelliae*) [*R.A.M.*, xvii, p. 71] indicated that the chemical composition of the leaf tissue is an important factor in the reaction of the host to the pathogen. Poor resistance is correlated with a low hydrogen-ion concentration of the juice, while a high tannin content confers ability to withstand infection. A negative correlation was observed between dorsal pubescence and the resistance of the leaf to mycelial invasion. Seedlings of eight tea strains segregated in a manner suggesting the involvement of more than two dominant genes in the production of resistant types.

WIEHE (P. O.). **Un nouvel hôte de la mosaïque de Tabac à Maurice.** [A new host of Tobacco mosaic in Mauritius.]—*Rev. agric. Maurice, 1939*, 106, p. 101, 1939.

The author recently observed in Mauritius a plantation of *Mucuna deeringiana* showing symptoms of tobacco mosaic. The plantation had been made in a field which previously carried a crop of tobacco strongly attacked by the disease. Inoculations of month-old tobacco seedlings in an insect-proof greenhouse by rubbing the leaves with juice from affected *M. deeringiana* plants gave positive results. On the tobacco seedlings the disease was much more severe than on the original host, the symptoms on tobacco including leaf-dwarfing and enations. Growers have been advised not to use *M. deeringiana* as a cover crop for rotation with tobacco.

KAUSCHE (G. A.) & STUBBE (H.). **Über die Entstehung einer mit Röntgenstrahlen induzierten 'Mutation' des Tabakmosaikvirus.** [On the origin of a Tobacco mosaic virus mutation induced by Röntgen rays.]—*Naturwissenschaften*, xxvii, 29, pp. 501–502, 2 figs., 1939.

In further experiments on the activation of the tobacco mosaic virus by means of X-rays [*R.A.M.*, xviii, p. 209], the writers subjected tobacco leaves containing 'normal' virus to irradiation in the range of 12,000 to 14,000 r. The inoculation of the juice extracted from the treated foliage into *Nicotiana langsdorffii* or *N. glutinosa* at first resulted in the development of 'normal' single lesions. These were isolated singly, extracted for 12 hours with m/15 phosphate buffer, and inoculated separately into plants of the susceptible Samson tobacco variety. Qualitative differences between the symptoms developing in the plants treated with 'normal non-irradiated' juice and that 'remaining normal after irradiation' were observed in the following directions. 1. A large percentage of the plants inoculated with 'normal' or 'irradiated normal' juice reacted, after a protracted incubation period (16 days longer than usual), by very faint or atypical mosaic symptoms. 2. In 1 to 2 per cent. of the plants inoculated with irradiated single-lesion juice, completely aberrant features, distinct from 'normal', aucuba, and yellow mosaic, developed and remained constant in transfers. Presumably a few protein molecules undergo some qualitative modification as a result of X-ray irradiation.

STANLEY (W. M.). **The isolation and properties of Tobacco ring spot virus.**—*J. biol. Chem.*, cxxix, 2, pp. 405–428, 1 fig., 1 diag., 1939.

A full account is given of the isolation of the nucleoprotein of the tobacco ring spot virus [*R.A.M.*, xvi, p. 568; xvii, p. 543] by means of differential centrifugation from diseased Turkish tobacco plants at the Rockefeller Institute for Medical Research, Princeton, [New Jersey]. The protein is denatured and inactivated by heating to 64° C., by treatment with nitrous acid, hydrogen peroxide, or 36 per cent. urea in 0·01 M phosphate at P_H 7, by standing at room temperature in aqueous solution, or by subjection to hydrogen-ion concentrations more alkaline than P_H 9 or more acid than about 6. A similar loss of activity follows freezing in solutions containing no extraneous materials,

but varying degrees of protection are afforded by the presence of electrolytes, plant pigments, or nutrient broth. One precipitation of ring spot virus with 30 per cent. ammonium sulphate at 4° causes substantial inactivation. Although solutions of the virus in 0·01 M phosphate buffer are fairly stable, there is a marked increase in viscosity and a somewhat rapid loss of activity in aqueous solution. Ring spot virus solutions containing 0·01 M phosphate buffer produced many more lesions on Black Eye cowpea leaves than those with a more concentrated or dilute phosphate buffer or other electrolytes (twice and four times the numbers obtained with 0·1 and 0·001 M phosphate buffer, respectively).

The tobacco ring spot virus has a sedimentation constant of 115×10^{-13}, an isoelectric point of P_H 4·7, a specific gravity of 1·57, yields isotropic pellets on ultracentrifugation, and exhibits no double refraction of flow. The molecular weight and diameter of the virus, based on some of these constants and on ultrafiltration data, are 3,400,000 and 19 mμ, respectively. Tobacco ring spot is the smallest of the viruses hitherto isolated and appears to be essentially spherical. It is quite unstable in comparison with tobacco mosaic and has not yet been secured in crystalline form. It contains some 40 per cent. nucleic acid, giving negative and positive reactions, respectively, to the desoxy sugar and pentose tests. The nucleic acid content is about eight times that of the tobacco mosaic virus, approaching the sperm nucleoproteins in this respect. The ring spot virus gives a specific precipitin reaction with its antiserum.

Stanley (W. M.). **Isolation of virus from plants recovered from the Tobacco ring spot disease.**—*J. biol. Chem.*, cxxix, 2, pp. 429–436, 1 fig., 1939.

Apparently normal tobacco leaves recovered from ring spot [see preceding abstract] were found to contain about one part of virus in 500,000 of fresh green leaf material, the corresponding figure for leaves on the same plants bearing many necrotic lesions being 1 in 80,000. No difference could be detected in the activity, sedimentation constant, isoelectric point, or general properties of the virus from the two sources, and it is therefore inferred that the infective principle is identical in both recovered and systemically diseased foliage. Recovery results from an adjustment of the host to the virus, apparently involving a gradual reduction of the level of concentration reached by the latter to about one-sixth of its original strength, a process accompanied by the disappearance of visible symptoms of the disease. Immunity would seem to be a sequel to the persistence of a low concentration of unaltered ring spot virus in recovered plants.

Naghski (J.), Harris (R. G.), Haley (D. E.), & Reid (J. J.). **Plant nutrition and disease resistance.**—Abs. in *J. Bact.*, xxxviii, 2, pp. 234–235, 1939.

Continuing their studies at the Pennsylvania Agricultural Experiment Station on nitrogen uptake in relation to the susceptibility of tobacco to leaf spots [*Bacterium tabacum* and *Bact. angulatum*: *R.A.M.*, xviii, p. 764], the writers found that this does not depend on the amount

absorbed (within reasonable limits), but on the stage in the life of the plant at which the element is assimilated. Thus, plants grown with adequate mineral utilization may mature with a nitrogen content of over 4 per cent. without significant loss of resistance to leaf spots if the nitrogen is supplied uniformly during the period of active growth. On the other hand, acute susceptibility may be shown by plants with a nitrogen content of less than 2 per cent. acquired erratically, with considerable quantities available at the approach of maturity. It is inadvisable, therefore, to use fresh animal manure, old legume refuse, or other sources of nitrogen providing a fluctuating and late supply of the element in the fertilization of tobacco and similar short-season crops.

HARRIS (R. G.), NAGHSKI (J.), FARRELL (M. A.), & REID (J. J.). **The relation of the soluble specific substance to virulence and specificity in bacterial leafspot organisms.**—Abs. in *J. Bact.*, xxxviii, 2, pp. 235–236, 1939.

Laboratory animals were immunized with cultures of *Pseudomonas fluorescens* and the cultures then cultivated in the presence of the homologous antiserum until 'R' forms were secured. These were used for immunization and the resultant 'R' cultures grown in the presence of the homologous antiserum and killed cells of *Phytomonas tabaci* [*Bacterium tabacum*: see preceding abstract], a procedure which yielded 'S' forms culturally and serologically identical with strains of the tobacco wildfire organism. In inoculation experiments the 'S' forms also produced on tobacco plants lesions identical with those of *Bact. tabacum*.

Similarly, 'R' forms of *Bact. tabacum* were obtained and cultivated in the presence of the homologous antiserum and killed cells of *Pseudomonas fluorescens*. The 'S' forms so derived were culturally and serologically identical with the strains of *P. fluorescens* killed and used in the culture medium. These 'S' forms gave negative results in inoculation tests.

Agglutinin absorption studies showed the 'R' strains produced from *P. fluorescens* and *Bact. tabacum* to be serologically identical. The same relationship was further found to exist between *P. fluorescens* and several other representatives of *Phytomonas*, including *P. angulata* [*Bact. angulatum*], *P.* [*Pseudomonas*] *cerasi*, *Phytomonas* [*Bact.*] *primulae*, and *P.* [*Bact.*] *vignae*. It is concluded from these data that specificity and virulence are associated with the nature of the soluble specific substance in this group of organisms.

PFANKUCH (E.) & KAUSCHE (G. A.). **Darstellung und Charakterisierung von Aucubamosaik-Virus.** [The preparation and characterization of the aucuba mosaic virus.]—*Biochem. Z.*, cccii, 1–2, pp. 77–83, 1 fig., 1 graph, 1939.

Using the same methods as those employed in previous work on the purification and characterization of the tobacco mosaic and potato X viruses [*R.A.M.*, xviii, p. 764 *et passim*], the writers isolated the tomato aucuba mosaic virus from diseased Samson Bashi Bagli tobacco plants and detected a close correspondence between the sedimentation curves and gold sol reactions of the tobacco and aucuba

mosaic viruses [ibid., xviii, p. 556], whereas potato virus X occupied an entirely different position in both respects. Both the tobacco and aucuba mosaic viruses attain their maximum sedimentation curve at an ammonium sulphate concentration of 25 per cent., as against 37·5 per cent. for potato virus X, and the gold sol reactions of the two former were also similar, passing from blue to bluish-purple flocculation and showing no trace of the red typical of potato virus X.

Fish (S.). **Tomato diseases and their control.**—*J. Dep. Agric. Vict.*, xxxvii, 8, pp. 378–391, 28 figs., 1939.

Brief, popular notes are given on the symptoms and control of the more important diseases affecting tomatoes in Victoria, including among many others *Phytophthora cryptogea* as a cause of damping-off; black dot root disease (*Colletotrichum atramentarium*) [*R.A.M.*, xvii, p. 96; cf. also ibid., xviii, p. 813], speck disease (*Bacterium punctulans*) [ibid., xvi, p. 820], and sun scald.

Black dot has sometimes caused serious damage in northern Victoria. The chief effect of an outbreak is to cause premature death, generally by the end of February, a serious matter in a locality where late crops are grown for pulping. In order to control the disease seedlings should be raised in sterilized soil, only healthy seedlings should be planted, and then only on land that has not grown tomatoes for several years, soil moisture should be kept fairly constant, diseased plants should be removed and burnt, and potatoes should not be included in the rotation.

Bacterial speck is of recent occurrence in Victoria. Seed sterilization and rotation should check the disease.

Sun scald may be identified by the whitish, leathery, sometimes wrinkled, patch on the side of the fruit exposed to the sun. Killing results from the combined effect of heat and light. Precautions against conditions producing defoliation will reduce sun scald.

Hartsuijker (K.). **Peritheciën van den Eikenmeeldauw : Microsphaera quercina (Schw.) Burr.** [The Oak mildew perithecia: *Microsphaera quercina* (Schw.) Burr.]—*Tijdschr. PlZiekt.*, xlv, 4, pp. 162–165, 1939.

Attention is drawn to the detection, for the first time in Holland, early in January, 1939, of the perithecia of *Microsphaera quercina* on oak (*Quercus pedunculata*) seedlings [*R.A.M.*, xvii, p. 438] in a warm frame at the Cantonspark, Baarn. Previous literature on the occurrence of the perithecial stage of *M. quercina* is briefly reviewed, and it is pointed out that the only countries from which the perfect phase is now absent are Great Britain, Belgium, and Scandinavia, probably on account of the predominantly adverse mean temperature and atmospheric humidity relations prevailing in these regions.

Wilkins (W. H.). **Studies in the genus Ustulina with special reference to parasitism. V. A disease of Elm (Ulmus campestris Sm.) caused by Ustulina.**—*Trans. Brit. mycol. Soc.*, xxiii, 2, pp. 171–185, 5 figs., 1939.

A fungus isolated from an elm tree felled near Princes Risborough was identified in pure culture as *Ustulina vulgaris* [*R.A.M.*, xviii,

p. 638] and determined as the sole agent of the disease by reinfection and subsequent reisolation. The tree showed no external symptoms of disease, but when felled the base of the trunk was found to be rotten in the centre. In both stem and roots the infected regions showed a more or less concentric zone of dark-coloured heart wood, surrounding the pale and brittle diseased wood, the peripheral layer remaining healthy. The disease was confined to the heart wood and extended up the trunk for a distance of about 10 ft. and into the roots for about 3 ft. Sections from the diseased tree showed the diseased area to be clearly deliminated by a black line, about 1 mm. wide, from the healthy heart wood, no hyphae being found outside it on microscopic examination of stained preparations. The first stage of decay in the elm wood is characterized by the occlusion of the fibres and wood parenchyma by infiltration products, probably some kind of lignin, which fill the fibres completely but are usually absent from the vessels, and the second by disintegration of wood tissue leading eventually to an almost complete disappearance of the fibres and wood parenchyma and to a considerable breakdown of the vessels of the summer wood. The medullary rays and large vessels of the spring wood alone resist disintegration. The disease of elms is stated to resemble closely that of lime, caused by the same fungus, and the final result of the decay to be almost identical in both.

GOIDÀNICH (G.). **Note fitopatologiche. I. Malattia dell' 'Ulmus pumila' L. causata da una Teleforacea.** [Phytopathological notes. I. A disease of *Ulmus pumila* L. caused by a member of the Thelephoraceae.]—*Boll. Staz. Pat. veg., Roma*, N.S., xix, 1, pp. 103–111, 7 figs., 1939.

In 1938 branches of *Ulmus pumila* taken from a tree showing symptoms resembling those due to *Graphium* [*Ceratostomella*] *ulmi* were received at Modena for examination. The wood showed a dark brown discoloration and from the infected material a Basidiomycete was consistently isolated, which in culture formed hemispherical, chestnut-coloured bodies, ½ to 2 cm. in diameter, and clavate basidia with hyaline, slightly opaque, ellipsoidal-oval, apiculate basidiospores, 3·5 to 5·1 by 2·2 to 3·2μ. It is suggested that the fungus may be a species of *Peniophora*.

GOIDÀNICH (G.) & VIVANI (W.). **Il ritrovamento dell' ascomicete 'Didymosphaeria populina' Vuill., parassita del Pioppo.** [The finding of the Ascomycete '*Didymosphaeria populina*' Vuill., a parasite of Poplar.]—*Boll. Staz. Pat. veg., Roma*, N.S., xix, 1, pp. 87–102, 2 pl., 4 figs., 1939.

Further cultural studies with *Pollaccia radiosa* from poplars in Italy [*R.A.M.*, xvii, p. 137] showed that the round bodies or rudimentary perithecia previously observed developed into fertile stromata or sclerotia externally indistinguishable from the former. The fertile stromata measured 89 to 268 (average 157)μ in diameter, but were often flattened at the sides, when they measured 141 to 219 (187) by 116 to 180 (152)μ. They were characterized by 4 to 12 loculi containing asci 136 to 170 (139) by 20·5 to 23·2 (21·5)μ with 8 (sometimes 6) light

brown to dark green, bicellular ascospores 23·7 to 33·5 (27·3) by 10·3 to 15·6 (14·2)μ, the larger cell being more or less hemispherical and the smaller conical with bulging sides. The ascospores were arranged in a single row with the rounded end generally facing the distal part of the ascus, or occasionally in a double row in the basal part. No ostiole was noted, the ascospores being released through a rupture in the wall.

There is no doubt that this fungus is the same as that described by Vuillemin in 1889 as *Didymosphaeria populina* [ibid., xvi, p. 71]. It is genetically related to *P. radiosa* (*Napicladium tremulae*), in the life-cycle of which the Sphaeropsid fungus associated with the same disease [loc. cit.] plays no part. *D. populina*, both in its ascigerous and imperfect stages, is a true parasite, causing conspicuous lesions on the leaves of vigorously growing poplars.

It is stated in a footnote that the fungus described by Servazzi in a paper issued while the present one was in the press as *Venturia populina* [ibid., xviii, p. 639] is evidently identical with the authors' fungus.

Smith (D. J.) & Smith (C. O.). **The use of special media for sporulation of fungi.**—*Phytopathology*, xxix, 9, p. 821, 1939.

Sporulation of the leaf-spotting fungi, *Stigmella platani-racemosae*, *Mycosphaerella stigmina-platani*, and *M. platanifolia* [*R.A.M.*, xvii, p. 492], was obtained on juice expressed from *Platanus racemosa* leaves, sterilized by filtration through Chamberland filters, and placed as drops either in van Tieghem cells or on slides in Petri dishes. Abundant spermatia were formed by these organisms on sterile filter paper in tubes to which the medium was added aseptically.

Bier (J. E.). **Hypoxylon canker of Maple.**—*Forest. Chron.*, xv, 2, pp. 122–123, 1 pl., 1939. [Abs. in *Biol. Abstr.*, xiii, 8, pp. 1401–1402, 1939.]

An account is given of a canker of maples (*Acer rubrum* and *A. saccharum*), associated with a species of *Hypoxylon*, probably *H. blakei*, at the Petawawa Forest Experiment Station, Ontario, Canada.

Brinkerhoff (L. A.). **Pathogenicity and pathological histology of Phymatotrichum omnivorum in a woody perennial, the Pecan.**—Abs. in *Phytopathology*, xxix, 9, p. 823, 1939.

Pecan roots showing incipient symptoms of infection by *Phymatotrichum* [in Arizona: *R.A.M.*, xiii, p. 639; xvii, p. 504] were found to be extensively damaged, but they may survive for periods of up to two years by means of shallow roots that have escaped infection. Recovery depends largely on the capacity for abundant adventitious root production after treatment. Roots of all sizes above $\frac{1}{8}$ in. in diameter readily contracted infection in inoculation experiments, the incubation period in August being about nine days and the average daily rate of spread of the fungus along the roots, primarily by means of strands over the surface, during July and August ranged from 0·6 to 0·8 in. Initial penetration was effected most rapidly through the lenticels, but was also observed to take place through the point of emergence of lateral roots and by way of normal breaks in the periderm, in the tissues underlying which, as well as in the cambial region, lateral dispersal is speedy. The pitted medullary ray cells are the main channels of radial penetration. Starch soon disappears from the invaded cells. Granular deposits

consisting of suberin or an allied substance were found in profusion in the zone of infection.

STREETS (R. B.). **The effect of intercrops and forage crops on the incidence and severity of Phymatotrichum root rot on Pecan.**—Abs. in *Phytopathology*, xxix, 9, p. 827, 1939.

Nearly all the serious outbreaks of root rot (*Phymatotrichum*) [*omnivorum*] in Arizona pecan [see preceding abstract] groves are stated to have occurred in areas intercropped with lucerne [*R.A.M.*, xii, p. 516], the roots of which provide a substratum over which the fungus moves rapidly and infects the trees. For example, in a 40-acre pecan grove on infected soil interplanted with lucerne there were 195 diseased trees after two years compared with only 58 in an adjacent orchard on even more heavily infested ground. Following removal of the susceptible intercrop, there is a gradual drop in the incidence of root rot, e.g., 114 new cases developed in June, 1938, in a 50-acre grove from which the lucerne was eradicated in the previous August, but only five in June, 1939.

JESSEN (W.). **Kalium- und Magnesiummangelerscheinungen und Wirkung einer Düngung mit Kaliumchlorid und Kalimagnesia auf das Wachstum verschiedener Holzarten.** [Potash and magnesium deficiency symptoms and the effect of manuring with potassium chloride and potash magnesia on the growth of various kinds of trees.]—*Ernähr. Pfl.*, xxxv, 8, pp. 228–230, 5 figs., 1939. [English and Spanish summaries on pp. 255–256.]

In a series of experiments at the Hann.-Münden College of Forestry, Germany, in which pine, spruce, and larch seedlings were grown in Neubauer dishes on quartz sand with and without potassium chloride and potash magnesia, chlorosis of the pine and spruce needles receiving no potash developed in July, followed in September by brown and reddish-purple discolorations [cf. *R.A.M.*, xvi, p. 573; xvii, p. 573]. In the pine seedlings the needle symptoms extended about half-way down from the tip, while the entire surface of the spruce needles was covered with brown spots. At the same time the larch needles became conspicuously chlorotic. Magnesium deficiency was characterized by reddish-brown and pale to livid discolorations of the needle tips of pine and spruce, respectively. Substantial yield increases in the dry weight of all three conifers were obtained by the application of potash in both forms.

MINKEVIČIUS (A.). **Veimutrūdes, Cronartium ribicola Dietrich, išsiplatinimo Lietuvoje, jos žalingumo ir jos žiemojimo Klausimu.** [The distribution in Lithuania of the Weymouth rust, *Cronartium ribicola* Dietrich, its effects and its overwintering on Currants.]—*Mém. Fac. Sci. Univ. Lithuanie*, xiii, 2, pp. 97–133, 1 fig., 2 graphs, 1 map, 1939. [English summary.]

The aecidial stage of *Cronartium ribicola* is stated to have been observed in 11 out of the 33 districts of Lithuania in which white pines (*Pinus strobus*) are cultivated. In 1937 *P. flexilis* was also attacked by the rust in the Kaunas Botanical Garden, where a series of experiments was carried out from 1935 to 1938 to investigate various important points in connexion with the disease.

Ten black currant bushes were planted between young infected white pines at short distances, while a further ten (controls) were set 1 km. away and observations were also made on others situated at various points outside a radius of 0·5 km. from the trees. The dates of the first appearance of the aecidia on *P. strobus* in the four years of the tests were 12th, 9th, and 13th April and 31st March, respectively, the corresponding dates for the primary outbreak of uredospore infection on currants (*a*) interplanted, (*b*) controls, and (*c*) outside the 0·5 km. radius being 3rd June, 15th, 13th, and 31st May, respectively, 27th July, 8th and 3rd June, and 28th July, respectively, and 2nd July, 5th and 7th June, and 7th July, respectively. Mass uredospore production on the interplanted currants began on 20th June, 22nd and 25th May, and 17th June, respectively, in the four experimental years, the corresponding dates for the controls in 1935, 1936, and 1937 being 26th September and 19th and 7th July, respectively, and for those outside the 0·5 km. radius 4th and 21st July and 2nd August, respectively, in 1936, 1937, and 1938. Currants interplanted among white pines were attacked not only earlier, but more severely, than those at a distance. Similar results were obtained in 1936 with the less susceptible red currants and gooseberries.

Discussing the problem of the overwintering of the white pine blister rust, the author's observations point to the extreme improbability of perpetuation by the uredospores in the climate of Lithuania. In a preliminary test in 1937, these organs retained their viability only for a month in the laboratory, while their capacity for the infection of black currant leaves after two months in the open was very slight. Moreover, the first spring outbreaks occur at the same time and with similar intensity on currants growing *en masse* or scattered, and irrespective of the extent of the previous season's infection. Likewise, the hypothesis that *C. ribicola* overwinters in the mycelial stage in currant tissues is inadmissible, the effect of the rust on the same bushes varying from year to year [*R.A.M.*, iv, p. 376]. Under Lithuanian conditions, therefore, the fungus survives from year to year only on white or other five-needled pines, from which the aecidiospores are disseminated in the early spring to currants in the vicinity. These in their turn produce, at the end of May or beginning of June, primary uredospores which are conveyed by the wind to the nearest currant bushes and there form mycelium and secondary uredospores. Allowing for a uredospore incubation period of 12 to 14 days and a sporulating season of at least eight weeks, four generations of uredospores may be produced during a growing season. The quantity of each generation increasing by geometrical progression, a few foci of aecidial infection on white pines will obviously suffice to spread the disease throughout the currant-growing districts of the country in the space of two to three months.

Kangas (E.). **Tutkimuksia Mäntytaimistotuhoista ja niiden merkitykestä.** [Investigations on the injuries occurring in Pine seedling stands and their importance.]—*Commun. Inst. for. fenn., 1937–8* 24, pp. 1–304, 25 figs., 1 map, 1938. [German summary. Received 1939.]

This exhaustive, fully tabulated, survey of the various forms of

injury occurring in Finnish pine stands in the early stages of growth contains the following information regarding fungal damage. *Cronartium peridermii-pini* [*C. asclepiadeum*: *R.A.M.*, xviii, p. 73] generally causes the death of the branches, twigs, and stems, spreading rapidly during the first summer; a typical feature of infection is a mosaic-like rupture of the cortex. The portions of the stem above the site of invasion become desiccated. *Dasyscypha fuscosanguinea* [ibid., xiv, p. 266] is also fatal to young trees, though its course may be slower than that of the rust. The cankers frequently start at the stem base. This pathogen is particularly severe in the north of the country.

Fungi attacking the needles are *Lophodermium pinastri* [ibid., xviii, p. 360], which often constitutes a critical factor in the well-being of stands up to ten years old (16 in the north); *Phacidium infestans* [ibid., xvii, p. 86], even more decisive within the same age limits, especially in the north; *Hypodermella sulcigena* [ibid., xviii, p. 490], mainly confined to the needles on the shoot tips and of less importance than the two foregoing; and *Coleosporium* spp., which as a rule attack only the third-year needles, causing a brown discoloration and shedding but not otherwise harming the trees.

Melampsora pinitorqua [ibid., xvii, p. 214] may be responsible for heavy damage to the shoots in the north, inducing desiccation, deformation, or even killing the young growth, in which case adventitious buds are put out and a bushy appearance imparted to the trees.

Armillaria mellea [ibid., xvii, pp. 714, 715] causes rapid desiccation, discoloration, needle fall, and finally death.

Badcock (E. C.). **Preliminary account of the odour of wood-destroying fungi in culture.**—*Trans. Brit. mycol. Soc.*, xxiii, 2, pp. 188–198, 1 fig., 1939.

The odour of cultures of wood-destroying fungi is considered to be a valuable diagnostic character, and may also be useful in the study of their metabolism. The characteristic odour developed usually when the cultures were about six weeks old and was identical in the several strains of the same fungus, even when isolated from different hosts, and remained constant in duplicated tests. Many species, the natural fruit bodies of which had no perceptible odour, produced a distinct aroma from the mycelium in culture. A striking similarity of odour appeared to exist among some related species, but no two species have been found with precisely the same odour.

A table is presented showing the odour of cultures of eighty different species of wood-destroying fungi and, where available, the smell of the natural fruit bodies of these species as recorded by various authors. A list of the odours of the natural fruit bodies of the higher fungi, compiled by E. J. Gilbert (Méthode de mycologie descriptive. Les livres du mycologue, iv, Paris. Le François, 1934) is appended. Fungi in which odour has already been found to assist in identification are *Trametes suaveolens* (with an odour resembling anisaldehyde), *Stereum sanguinolentum* (fragrant), *Lenzites trabea*, *Pholiota adiposa*, *Lentinus lepideus*, *Polystictus versicolor*, and three others.

Buchwald (N. F.). **Rødkaernet Bøgetraes Modstandsevne mod tømmersvampe (Merulius lacrymans, Coniophora cerebella og Polyporus vaporarius).** [The capacity of red-heart Beech wood for resistance to timber fungi (*Merulius lacrymans*, *Coniophora cerebella*, and *Polyporus vaporarius*).]—*Dansk Skovforen. Tidsskr., 1939*, pp. 238–251, 3 figs., 3 graphs, 1939.

A tabulated account is given of the writer's laboratory experiments at the Danish Agricultural College, Copenhagen, to determine the relative pathogenicity of malt extract cultures of three wood-destroying fungi, *Merulius lacrymans*, *Coniophora cerebella* [*C. puteana*], and *Polyporus vaporarius* [*Poria vaporaria*], to unimpregnated and impregnated wood blocks of white beech (*Fagus sylvatica*), unimpregnated blocks of red-heart beech (*F. sylvatica*), and impregnated blocks of mixed white and red-heart beech, unimpregnated blocks of spruce (*Picea abies*) [*R.A.M.*, xvii, p. 641] being included in one series for control purposes. Impregnation was carried out with tar oil in each case.

M. lacrymans was found to be the most destructive of the three fungi, causing losses of 48, 27, and 43 per cent., respectively, in unimpregnated white and unimpregnated red-heart beech and spruce in 7½ months, the corresponding percentages for *C. puteana* being 37, 29, and 31, and for *P. vaporaria* 22, 17, and 22, respectively. *M. lacrymans* made much slower progress than the other two organisms in the decomposition of the wood in the initial stages of the tests, but after five months the relative positions were reversed. Impregnated beech wood, both white and red-heart, sustained little damage from the pathogens under observation, the loss of weight amounting to only 5 to 6 per cent., mostly occurring during the first two months. The treated white wood seemed to be slightly more resistant than the red.

Broese van Groenou (H.). **Die Kreosotdurchtränkung von Buchenholz und die Faktoren die sie beeinflussen.** [The penetration of Beech wood by creosote and the factors influencing it.]—Thesis, Delft, 1938. [Dutch. Abs. in *Holz Roh- u. Werkstoff*, ii, 7–8, p. 307, 1939.]

Tyloses in beech wood vessels constituting a hindrance to the penetration of creosote [as a preservative against fungal infection], an intensive study was made of the conditions governing their formation. They were found to originate in the medullary ray parenchyma, and to develop in the vessels chiefly of living wood felled during the summer. The process may be partially counteracted, but not wholly prevented, by the speedy killing of the wood, e.g., by rapid drying, but the certain avoidance of tyloses can only be ensured by winter felling [cf. *R.A.M.*, xviii, p. 357]. Liquids such as water and alcohol, which induce swelling of the cell walls, are able to penetrate the wood in a radial direction, whereas 'apolar' fluids, benzol or creosote, for instance, cannot do so. Creosote can only traverse the vessels and tracheids, and its rate of penetration is a function of viscosity. The partial obstruction of the vessels by tyloses is believed to be responsible for various defects in the impregnation of railway sleepers.

LEVÓN (M.). **Some results of investigations dealing with the use of Birch as raw material for the plywood industry.**—*Papp. Trävaru-tidskr. Finl.*, xxi, 14, pp. 500–501; 15, p. 539; 16, pp. 569–570, 4 graphs, 1939.

Discussing the possibilities of an extended use of birch as a raw material for the Finnish plywood industry, the writer points out that felling the trees in leaf, though it reduces the water content of the trunks and assists floating, exposes the wood to much greater risks of bacterial and fungal infection than is the case with winter-felled logs [see preceding abstract]. By the latter half of August or the early part of September, however, felling may be carried out without any great danger of serious attacks by the micro-organisms which are the chief agents of discoloration in stored wood. Very good control of staining has been obtained by the Runbäck water-sprinkling method [*R.A.M.*, xvi, p. 575], whereby the logs and the surrounding atmosphere are maintained at a constant moisture-level, only about 7 per cent. discoloration developing in the treated material after five months as against roughly 28 per cent. in the untreated. Certain tarry substances, e.g., bitumen 80°/90°+10 per cent. creosote oil, applied to the ends of the logs, have also given promising results.

FINDLAY (W. P. K.). **Note on an abnormal fungus on Birch.**—*Trans. Brit. mycol. Soc.*, xxiii, 2, pp. 169–170, 1 pl., 1939.

An interesting fungus was collected in 1938 on a birch tree at Aviemore, Inverness-shire, consisting of a coal-black mass about 30 cm. across, in general appearance suggesting a large clinker. It was very much cracked, extremely hard and brittle, dark reddish- to yellowish-brown in the interior with a very thin, carbonaceous external layer. There was no sign of any fertile tissue. The fungus grew readily on malt agar and produced basidia with hyaline or faintly yellowish basidiospores, 8 to 10 by 4 to 5μ. Dark brown, thick-walled, bulbous setae occurred in the hymenium. The organism is considered to be identical with that described by Mme Katayevskaya as the 'tchaga' fungus on birches in the U.S.S.R. [*R.A.M.*, viii, p. 345], and also with that described by Campbell and Davidson [ibid., xviii, p. 146] as a *Poria* belonging probably to the *P. obliqua* complex. In culture the fungus differed from *Fomes igniarius* while the size of the spores produced agreed closely with that given for *P. obliqua*, to which species the Aviemore fungus is probably related.

BRAJNIKOFF (B. J.). **Resin-impregnated wood.**—*Chem. Prod.*, ii, 3, pp. 71–77, 2 figs., 1 graph, 1939.

In this paper the author describes a method of impregnating wood with synthetic resins which is stated to render it exceedingly inert and immune from attack by micro-organisms. Treated wood is eminently suitable for electrotechnical apparatus.

CHIDESTER (MAE S.). **Further studies on temperatures necessary to kill fungi in wood.**—*Proc. Amer. Wood Pres. Ass.*, xxxv, pp. 319–324, 2 graphs, 1939.

Continuing her studies on the temperatures required to destroy fungi in wood [*R.A.M.*, xvii, p. 4], the writer exposed to a range of

104° to 212° F. sticks of *Pinus taeda* inoculated with *Fomes roseus*, *Lenzites trabea*, *Trametes serialis*, *Lentinus lepideus*, *Lenzites sepiaria*, and *Poria incrassata* [ibid., xviii, p. 285], of which the three last-named had already been used in the previous series of experiments. *P. incrassata* proved to be much the most sensitive to heating of all the fungi tested, while *L. trabea*, *L. sepiaria*, and *Lentinus lepideus* were the most resistant. The recommendations for the temperatures and heating periods at the zone of infection requisite for the destruction of the fungi under observation are the same as those already given, except that the time at 150° has been extended from 60 to 75 minutes owing to the resistance of *L. trabea*. Temperatures below 150° appear to be impracticable, the more resistant fungi surviving 12 hours at 140°, 20 at 131°, and 24 at 122°.

LINDGREN (R. M.) & SCHEFFER (T. C.). **Effect of blue stain on the penetration of liquids into air-dry Southern Pine wood.**—*Proc. Amer. Wood Pres. Ass.*, xxxv, pp. 325–337, 1939.

The absorption of water during periods ranging from ½ to 55 hours was found to be substantially greater in blocks of *Pinus taeda* wood stained by inoculation with *Endoconidiophora moniliformis*, *Graphium rigidum* [*R.A.M.*, xiv, p. 729], and *Hormonema* sp. than in matched unstained wood. No relation was observed between the amount of discoloration produced by the different fungi and the degree of absorption. The increased uptake of water was largely confined to the first half-hour of soaking, during which period the percentages for the blocks inoculated with *E. moniliformis*, *G. rigidum*, and *H.* sp. were 52·3, 53·7, and 42·2, respectively, compared with 30·2, 39·5, and 34·9 for the untreated controls; after five hours the unstained material absorbed as much water during a given time as the stained, or more.

The absorption of creosote applied as a hot-and-cold bath and as a pressure treatment was 110 to 140 and 140 to 150 per cent., respectively, greater in *P. palustris* bolts stained with *Ceratostomella pilifera* [ibid., xvi, pp. 578, 787] than in corresponding unstained material, penetration of the sapwood being complete in the former and only partial in the latter. An important factor in the greater penetrability of the stained wood is believed to be its increased porosity due to partial breakdown of the ray parenchyma, together with some direct penetration of the tracheid walls.

On the basis of these results, discrimination against air-dry stained wood on the grounds of reduced penetrability by liquids is considered to be untenable, but no argument in favour of the use of such material in commercial practice is hereby intended. Bright wood should be preferred whenever a choice is feasible, except where the reduction of decay to a negligible incidence has become a part of routine practice.

WINNIG (K.). **Der Schutz von Holzmasten bei der deutschen Reichspost.** [The protection of wooden poles in the German Postal Service.]—*Holz Roh- u. Werkstoff*, ii, 7–8, pp. 272–278, 1 graph, 1939.

This is a historical survey of the development of the measures adopted by the German Postal Service for the preservation of telegraph poles against insect and fungal damage since 1852. From this date to the

turn of the century zinc chloride, copper sulphate, mercuric chloride, and coal tar were used; of late years these have been largely replaced by fluorine derivates of sodium-di-nitrophenol and arsenic compounds, of which basilit UA (thanalith) [*R.A.M.*, xvii, p. 495] has proved to be the most effective. Full details are given of the Boucherie treatment with chrome arsenic-containing salt mixtures. Osmosis [ibid., xviii, p. 775] by means of osmolit U-arsen (of similar composition to basilit, with the addition of 5 per cent. of an adhesive glue), is recommended for newly felled wood. The conservative Rueping coal tar process [ibid., xvii, p. 2; xviii, p. 564] is considered to be superior to all other methods of timber preservation, the estimated duration of life of poles thus treated being 32 to 35 years compared with 30 to 32 for improved kyanization (a mixture of mercuric chloride and sodium fluoride); the number of poles impregnated by the Rueping process in Germany in recent years far exceeds those submitted to any other form of treatment.

Marchionatto (J. B.). **Argentine Republic: first record of Erwinia carotovora in the country.**—*Int. Bull. Pl. Prot.*, xiii, 8, p. 177 M, 1939.

Attention is drawn to the recent detection, for the first time in the Argentine, of *Erwinia carotovora* on white cabbage and peppers [*Capsicum* spp.]. In laboratory experiments the organism proved severely pathogenic to peppers, tomatoes, cucumbers, potatoes, carrots, radishes, and kohlrabi. Heavy damage is caused not only in the field but in storage. Control measures should include crop rotation with cereals and forage crops, storage under dry, well-ventilated conditions at a temperature near 0° C., and disinfection of the storehouses with copper sulphate.

Dennis (R. W. G.). **Notes on seed transmission of Phoma lingam in relation to dry rot of Swedes in Scotland.**—*Ann. appl. Biol.*, xxvi, 3, pp. 627–630, 1939.

During 1938, heavy losses from dry rot of swedes (*Phoma lingam*) [*R.A.M.*, xviii, p. 234] were sustained in north-eastern and south-western Scotland. In the Lothians the disease occurs on swedes in freshly broken old pasture, and in fields where a ten years' rotation has been practised.

Three samples of seed of known origin gave, respectively, 4, 5·66, and 1·74 per cent. infected seedlings [ibid., xiii, p. 487]. If, as Buddin estimates, 1 per cent. infected seed is equivalent to 3,000 infected seeds per acre, then 5 per cent. infection means sowing about one infected seed to each group of seedlings removed at singling. As, however, infected seedlings, if established, are probably cut down in singling, it becomes very unlikely that infection of a swede during autumn is due to infection of that plant from the seed at germination. The sowing of infected seed must, on the other hand, result in the distribution of infected debris very evenly over the fields. The solution of the problem would appear to consist in a more rigorous inspection and selection of seed plants.

In estimating the degree of seed infection the maximum amount of direct sunlight during germination is requisite for diagnosis from pycnidial development. Brown markings or stripes on the hypocotyl

of seedlings are not a sufficient indication of infection by *P. lingam*, as they may be caused by *Alternaria brassicae* or *Cladosporium* sp.

Le Clerg (E. L.). **Studies on dry-rot canker of Sugar Beets.**—*Phytopathology*, xxix, 9, pp. 793–800, 2 figs., 1939.

The average hyphal diameter of six isolates of sugar beet dry rot canker (*Rhizoctonia* [*Corticium*] *solani*) [*R.A.M.*, xviii, p. 776] collected during the summers of 1936 and 1938 in Minnesota and Colorado ranged from 7·4 to 8 μ after 14 days on potato dextrose agar, the corresponding figure for a beet crown rot isolate being 8·6 μ. In a comparative study on three artificial media the average radial growth of the same six dry rot canker isolates, six from crown rot, and six from potato, was 22·2, 34·6, and 20·6 mm., respectively. The optimum temperature for the two lots of beet isolates was 30° C., while those from potato throve best at 25°.

The results of greenhouse experiments in soil-temperature tanks showed the dry rot canker pathogen to be most active in root decay at 30° to 35°, with a relatively low soil moisture content. In soil inoculation tests at 18° to 20°, the dry rot canker and crown rot isolates were about equally virulent (average 21·4 and 21·9 per cent., respectively) in the causation of maize rot, the pathogenicity of the potato group being much weaker in respect of this host (4·4 per cent.). In experiments on peas, sugar beets, and cabbage the average reduction of stand caused by the dry rot canker group was 35·7, 14·1, and 12 per cent., respectively, the corresponding figures for crown rot strains being 77·1, 59, and 55, and for potato strains 13·3, 9·4, and 14. In another series of tests the average losses from four of the dry rot canker isolates on beans [*Phaseolus vulgaris*], peas, sugar beets, and cabbage were 38·4, 73·5, 10·2, and 34 per cent., respectively, and from the same number of crown rot strains 78·3, 100, 94·1, and 91·3.

In comparative inoculation tests on sugar beets with one isolate each of the dry rot canker and crown rot groups, the former produced the typical deep, localized lesions and the latter a more generalized decay. Though the differences between the dry rot canker and crown rot pathogens appear to warrant specific distinction, such a step is considered inadvisable until the perfect stage of the former has been found.

Dundas (B.) & Scott (G. W.). **Physiologic strains of Bean rust.**—*Phytopathology*, xxix, 9, pp. 820–821, 1939.

In comparative inoculations with four physiologic races of bean [*Phaseolus vulgaris*] rust [*Uromyces appendiculatus*: *R.A.M.*, xviii, p. 366], viz., two described and supplied by Harter [ibid., xiv, p. 669] and one each from the commercial fields of Washington and Florida, on three differential varieties, Brown Kentucky Wonder No. 928 proved to be resistant to Harter's two and the Florida strain but susceptible to that from Washington, Tennessee Green Pod was highly susceptible to all except the Florida strain, while Golden Gate showed high resistance to all except Harter's race 2. It is thus apparent that the Washington and Florida collections of *U. appendiculatus* differ from each other as well as from Harter's strains.

Dundas (B.). **Inheritance of resistance to powdery mildew in Runner Beans (Phaseolus coccineus), Tepary Beans (P. acutifolius), Yard Long Beans (Vigna sesquipedalis) and Cowpeas (Vigna sinensis).**—Abs. in *Phytopathology*, xxix, 9, p. 824, 1939.

Runner (*Phaseolus coccineus*), tepary (*P. acutifolius*), and yard-long beans (*Vigna sesquipedalis*), and cowpeas were found to comprise varieties both resistant and susceptible to various bean and cowpea strains of powdery mildew (*Erysiphe polygoni*) [*R.A.M.*, x, p. 74; xvi, p. 796; xviii, p. 465]. Crosses were made between the resistant and susceptible varieties and have been maintained through the F_2 generation. All the resultant F_1 plants were resistant, while the F_2 progeny segregated in a ratio of 3 resistant to 1 susceptible, denoting that resistance to strains 2 and 3 in the Gray Mottled tepary, in Blackeye cowpeas, and in *V. sesquipedalis* is due to a single dominant Mendelian factor. Moreover, the individual F_2 plants of tepary and *Vigna* reacted identically to strains 2 and 3, showing that a single factor operates in both instances. The F_2 from a cross between a resistant Blackeye and a resistant yard-long yielded exclusively resistant progeny, showing that both contain the same factor for resistance.

Freitag (J. H.) & Severin (H. H. P.). **Additional Celery viroses.**—Abs. in *Phytopathology*, xxix, 9, p. 824, 1939.

Pseudo-calico, a new virus of celery in California, has not been transmitted, unlike celery crinkle leaf, poison hemlock [*Conium maculatum*] ring spot, and celery yellow spot [*R.A.M.*, xviii, p. 369], by any of the nine species of aphids breeding on the host. The crinkle leaf and ring spot viruses were retained by their aphid vectors for less than 24 hours, whereas that of yellow spot was harboured by the honeysuckle aphid (*Rhopalosiphum melliferum*) for twelve days. The pseudo-calico and ring spot viruses have been transmitted by sap inoculation, but not that of yellow spot. The ring spot has further been transmitted with difficulty from parsley to parsley but not to celery. The thermal inactivation point, dilution tolerance, and longevity *in vitro* of pseudo-calico are 70° C., 1 in 1,000, and five days, respectively, the corresponding figures for crinkle leaf being 60°, 1 in 100, and three days, respectively. Pseudo-calico has so far been transmitted to twelve species of plants in five families, whereas the host ranges of crinkle leaf and ring spot are limited to the Umbelliferae.

Chamberlain (E. E.). **Cucumber-mosaic (Cucumis virus 1 of Smith, 1937).**—*N.Z. J. Sci. Tech.*, A, xxi, 2, pp. 74–90, 7 figs., 1939.

Cucumber mosaic [*R.A.M.*, xviii, p. 726], first observed in New Zealand in 1931 and described by the author under the name of 'narrow leaf' of tomato [ibid., xiv, p. 462], causes serious losses in the cucumber, rock melon (*Cucumis melo* var. *cantalupensis*), and tomato crops in the Poverty Bay district, and of the last-named also at Christchurch, other natural hosts being vegetable marrow and *Polyanthus*. The virus is perpetuated by marrow seed and transmitted from diseased to healthy plants by *Aphis gossypii*, *Myzus persicae*, and *Macrosiphum solani*. In greenhouse inoculation experiments the juice of diseased marrows or cucumbers successfully transmitted infection to tobacco, *Nicoti-*

ana rustica, *Physalis peruviana*, eggplant, *Datura stramonium*, chilli, *Petunia hybrida*, blue, yellow, and flowering lupins (*Lupinus angustifolius*, *L. luteus*, and *L. polyphyllus*), pansy, violet, [China] aster (*Callistephus chinensis*), *Primula sinensis*, *P. obconica*, and spinach, brief descriptions of the symptoms on these hosts being given. The virus was found to survive a period of over four days *in vitro*; its dilution end and thermal death points are 1 in 1,000 and 62° to 66° C., respectively, and it failed to traverse a 'preliminary' Mandler filter (requiring a pressure of 5 lb.). Control measures based on sanitary precautions are briefly indicated.

THOMAS (K. M.) & KRISHNASWAMI (C. S.). **Little leaf—a transmissible disease of Brinjal.**—*Proc. Indian Acad. Sci.*, Sect. B., x, 2, pp. 201–212, 2 pl., 1939.

The new disease of brinjal [eggplant], apparently due to a virus, recently observed at Coimbatore [*R.A.M.*, xviii, p. 90], damaged nearly 50 per cent. of the crop at Nilampur in 1938. The chief symptom is a reduction in leaf size, the new leaves becoming smaller and smaller and almost sessile. The lamina becomes thin, soft, glabrous, and pale green. In thorny varieties the thorns are attenuated or absent. The growth of axillary and latent buds is stimulated, and the internodes are shortened. The suppressed branches with numerous reduced leaves become crowded together at the axils, the affected plants becoming so bushy as to be scarcely recognizable. Frequently there is no trace of the floral parts, and where these are present the corolla, androecium, and gynoecium are green. When the condition develops after flower formation, the flowers are shed and fruits are seldom set. Plants become affected in all stages of growth. No virus disease with the symptoms described appears to have been recorded hitherto, and K. M. Smith has suggested *in litt.* that the virus be named *Datura* virus 2.

The disease also occurs in nature on purple and white varieties of *D. fastuosa*. On the former, phyllody is sometimes present, but the flowers are often normal, and viable seeds are seldom produced. All South Indian eggplant varieties appear to be susceptible.

Sap inoculations from affected eggplants gave negative results, but the disease was successfully transmitted by grafting from eggplant to eggplant, tomato, tobacco, *D. fastuosa* (white and purple), and *Solanum trilobatum*, from tomato to tomato, from *D. fastuosa* to eggplant, and from purple *D. fastuosa* to tomato. Insect transmission was effected by means of *Empoasca devastans* from eggplant to eggplant, and by means of *Eutettix phycitis* from eggplant to eggplant and to *S. xanthocarpum*. Both Jassids are common locally. When two lots of seed from partially diseased eggplants and *D. fastuosa* were sown under insect-proof conditions, no disease appeared on the seedlings.

Control measures recommended until resistant varieties are found consist in the eradication of Solanaceous weeds and prompt roguing out of diseased plants. In a field where these measures were applied the incidence of disease was markedly diminished.

SHAW (L.). **Control of Cercospora leaf spot of Peanut with various dusts and sprays.**—Abs. in *Phytopathology*, xxix, 8, p. 751, 1939.

In 12 experimental one-acre groundnut plantings in North Carolina

in 1937 and in 15 in 1938, sulphur dust was applied at the rate of 16 lb. per acre on 25th July, 14th August, and 1st September for the control of leaf spots (*Cercospora*) [*personata* and *C. arachidicola* = *Mycosphaerella berkeleyii* and *M. arachidicola*: *R.A.M.*, xviii, p. 571], the incidence of which was thereby reduced by about 75 per cent. in each season, the corresponding decrease in defoliation from the treatment being estimated at 70 per cent. The average increases in the nut crops on the dusted plots were 343 lb. in 1937 and 217 in 1938, while the hay yield was substantially augmented in both years. In $\frac{1}{40}$-acre test plots in 1938, three applications of 4–4–50 Bordeaux mixture, 1½ to 50 cuprocide 54 [ibid., xviii, p. 787], or sulphur dust effectively combated the leaf spots and materially increased the nut and hay yields. Lime-sulphur (1 in 40) controlled the fungi but damaged the foliage, so that production was not appreciably improved.

WOODROOF (N[AOMI] C.) & HIGGINS (B. B.). **Dusting Spanish Peanuts with sulphur.**—*Circ. Ga agric. Exp. Sta.* 117, 12 pp., 5 figs., 1939. [Abs. in *Exp. Sta. Rec.*, lxxxi, 4, p. 529, 1939.]

Satisfactory control of the *Cercospora* leaf spots of groundnut [*Mycosphaerella arachidicola* and *M. berkeleyii*: see preceding abstract] and increased yields were obtained in Georgia by three applications, at fortnightly intervals, in the early morning or late afternoon, beginning 60 to 65 days after planting, of 45 to 55 lb. per acre 325-mesh sulphur.

HUMPHREY (N.). **A Groundnut wilt disease on the coast of Kenya.**—*E. Afr. agric. J.*, v, 2, pp. 110–112, 1939.

In 1931, groundnuts of different varieties planted in observation plots in the coastal regions of Kenya wilted and died as a result of infection by a species of *Fusarium* [*R.A.M.*, xiii, p. 217]. The outer leaflets turned yellow, closed together, and collapsed, the affected plants then either dying off rapidly and completely, after shedding a great part of the foliage near the crown, or partially recovering and setting a small crop. The tap-roots of affected plants showed some rotting. The disease was also found in native gardens, and was clearly the limiting factor in the development of groundnut cultivation in the coastal areas. Of the varieties grown in the observation plots, only one, a creeping type from Nyanza, retained any healthy plants, about 40 per cent. of the plants of this variety ripening off normally. Selection work with this type has yielded some strains with high resistance. One other variety, a bunch type named Akola 10, is being retained for further trial.

RICHARDS (M. C.). **Downy mildew of Spinach and its control.**—*Bull. Cornell agric. Exp. Sta.* 718, 29 pp., 4 figs., 6 graphs, 1 map, 1939.

Spinach downy mildew (*Peronospora spinaciae*) [*P. effusa*: *R.A.M.*, xviii, p. 275] is stated to be responsible for the annual failure of from 3 to 15 per cent. of the United States crop. In Nassau County, New York, annual losses are usually from 3 to 8 per cent. but may rise in some districts to 20, and entire plantings may sometimes be lost. During a study of this disease conducted from 1934 to 1938 the inoculation of 15 species from eight genera of the Chenopodiaceae and three species of *Amaranthus* with *P. spinaciae* entirely failed to produce infec-

tion, and it is believed that the host range of this pathogen is limited to the genus *Spinacia*. All the 35 commercial spinach varieties tested were equally susceptible to the disease, which is characterized by yellowing, stunting, and necrosis of the affected areas.

The causal agent differs morphologically from the downy mildews of other Chenopodiaceous plants. The history and systematic position of the fungus are reviewed. The name *P. effusa* (Grev.) Rabenh. is held to be incorrectly applied to the spinach mildew, as Rabenhorst studied a fungus on *Chenopodium* which Laubert in 1906 showed to be a distinct species [but see Art. B 54 of the International Rules of Botanical Nomenclature: ibid., xvi, p. 482]. The author accepts Laubert's name *P. spinaciae* for the mildew on spinach.

Overwintered infected plants were found to be the only important source of primary inoculum on Long Island, while susceptible weeds, infected and infested seeds, or infested soil seemed to be of no or little importance. Wind and rain were the chief agents of dissemination.

Conidial germination takes place only in the presence of free water. Age exerted a marked influence on germinability, conidia less than 1, 1, 2, and 3 days old showing, respectively, 53·4, 61·1, 16·0, and 0·1 per cent. germination in one test; in another 4·6 per cent. germination was observed in conidia 9 days old. The viability was greatly reduced by short periods of desiccation or exposure to sunlight. The optimum, minimum, and maximum temperatures for germination were found to be about 9°, 2°, and 27° C., respectively. Germ-tube elongation was greatest at 12° C. At temperatures of 60° to 65° F. infection took place in less than three hours after inoculation. The fungus required a relative humidity of 85 per cent. or above for fruiting; in greenhouses with relative humidities of 70 to 90 per cent. and temperatures of 60° to 75° fruiting never occurred before six days and in most cases the period was longer. Epiphytotics of the disease in Long Island were observed to depend on the combination of the following conditions: vigorous growth of plants at the time of inoculation, the presence of great numbers of conidia enabling many plants to be inoculated simultaneously, mean temperatures of 45° to 65° prevailing for a week or more, the presence of water on the leaves for periods of three hours or longer, and the maintenance of high relative humidities during infection and the fruiting of the fungus.

The application of copper oxide (cuprocide 54) at the rate of 1·75 lb. in 50 gals. water reduced the number of infected plants from 13·4 to 3·9 per cent., but produced slight injury. The isolation of overwintered spinach from winter and spring plantings is recommended for the control of the disease on Long Island.

Fumigation of Mushroom houses with hot formaldehyde gas from outside vaporizer for control of undesirable fungi.—*Agric. News Lett.*, vii, 8–9, pp. 77–78, 1939. [Mimeographed.]

An effective, economical method of fumigating mushroom [*Psalliota* spp.] houses consists in preparing the house for a new crop by thorough cleaning and washing with water or a solution of 4 per cent. commercial formalin (37 per cent.) in water, after which the house is carefully sealed and fumigated with formaldehyde gas. The gas is obtained

by vaporizing commercial formalin diluted with an equal quantity of water in a small boiler heated by oil or wood, set up outside the house, and connected with it by a 2 in. iron pipe. The house is then aired, the compost, pasteurized by high temperature fermentation, is laid, and the spawn planted. If *Mycogone* [*perniciosa*] develops, the affected areas can be controlled by sprinkling with 4 per cent. formalin. In the spawn plant the inoculating rooms are fumigated with formaldehyde, and all crates are dipped in 4 per cent. formalin before being used for the culture bottles. The fumigation dosage is one quart (2¼ lb.) of commercial formalin to about 1,000 cu. ft. of space, and exposure lasts 24 hours.

Rui (D.). **Relazione sulle prove di lotta contro alcune malattie della Vite, effettuate nel 1938.** [An account of experiments in the control of some Vine diseases carried out in 1938.]—*Ric. sci. Progr. tec. Econ. naz.*, Ser. 2, x, 5, pp. 440–445, 1939.

Further experiments in 1938 at Conegliano, Italy, in the control of vine *Peronospora* [*Plasmopara viticola*] and *Oidium* (*Uncinula necator*) confirmed previous results as to the efficacy for this purpose of Prodotto d'Agostino (formula C) and cuprital [*R.A.M.*, xvii, p. 583], whereas copper borate was slightly less effective than Bordeaux mixture. The composition of Agostino C is given as 200 gm. each of copper sulphate, sodium hydrosulphide, and adhesive, and 500 gm. lime; formula B (200 gm. of each ingredient) gave slightly inferior results. Politional, a polysulphide adhesive, was added to cuprital at the rate of 400 gm. per hectol. in some of the tests with satisfactory results.

Summary of legislation affecting agricultural industries as at 31st December, 1938. Plant quarantine.—*Rep. agric. Dep. St Kitts-Nevis, 1938*, pp. 26–29, 1939.

By Statutory Rules and Orders No. 13 of 1938 the import of the following into St. Kitts-Nevis is forbidden: banana plants and parts thereof from all areas (against Panama disease [*Fusarium oxysporum* var. *cubense*] and root disease [? *Marasmius stenophyllus*]) but excepting fruit from the United States and other islands of the Leeward group; citrus fruits, plants and parts thereof from Cuba, Haiti, Santo Domingo, Puerto Rico, and the United States (against citrus canker [*Pseudomonas citri*] and other diseases); sugar-cane seedlings and plants, and all sugar-cane parts from all areas (against diseases at present unknown in the Presidency); plants growing in soil from all areas; and soil from all areas except the British Isles, Canada, the United States, and certain islands of the British West Indies.

Service and regulatory announcements. April–June, 1939.—*S.R.A., B.E.P.Q., U.S. Dep. Agric.*, 139, pp. 85–92, 1939.

Summaries are given of the plant quarantine import restrictions in force in Malta (amended), Rumania, St. Lucia, Venezuela, and New Guinea, together with a list of the declared plant diseases specified in the last-named country's Diseases of Plants Proclamation No. 1 of 18th June, 1938.